

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**

**AIR FORCE INSTRUCTION 11-2F-22A,
VOLUME 3**



8 DECEMBER 2009

Flying Operations

F-22A--OPERATIONS PROCEDURES

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: Publications and forms are available for downloading or ordering on the e-Publishing website www.e-publishing.af.mil.

RELEASABILITY: There are no releasability restrictions on this publication.

OPR: HQ ACC/A3TO

Supersedes: AFI11-2FA-22V3, 17 August
2004

Certified by: HQ USAF/A3O-A
(Mr. Gerald F. Pease, Jr., SES)

Pages: 74

This volume implements AAFP 11-2, *Aircraft Rules and Procedures*; AAFP 11-4, *Aviation Service*. It applies to all F-22A units. This publication applies to the Air National Guard (ANG) and Air Force Reserve Command (AFRC). This publication is not applicable to the Civil Air Patrol. MAJCOMs will coordinate proposed MAJCOM/DRU/FOA-level supplements to this volume through HQ ACC/A3TO to HQ AFFSA/A3OF prior to publication. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located at <https://www.my.af.mil/gcss-af61a/afrims/afrims/>. Copies of MAJCOM/DRU/FOA-level supplements, after approved and published, will be made available on the e-Publishing website at www.e-publishing.af.mil. MAJCOMS determine the review process for unit-level supplements. **NOTE:** The terms Direct Reporting Unit (DRU) and Field Operating Agency (FOA) as used in this paragraph refer only to those DRUs/FOAs that report directly to HQ USAF.

Waiver authority to this publication is described in [paragraph 1.3](#). See [paragraph 1.4](#) for guidance on submitting comments and suggesting improvements.

This instruction requires the collection or maintenance of information protected by the Privacy Act of 1974. The authority to collect and maintain the records prescribed in this instruction are 37 USC 301a, Incentive Pay; Public Law 92-204 (Appropriations Act for 1973), Section 715; Public Law 93-570 (Appropriations Act for 1974); Public Law 93-294 (Aviation Career Incentive Act of 1974); DOD Instruction 7730.57, *Aviation Career Incentive Act of 1974 and Required Annual Report*; AFI 11-401, *Aviation Management*; and E.O. 9397, "Numbering System for Federal Accounts Relating to individual Persons."

SUMMARY OF CHANGES

This publication contains significant revision. Of note, incorporates SII guidance on aviation fundamentals; clarifies use of briefing term “standard”; incorporates previous PACAF-only mission guidance for multiple-go days; adds G-awareness exercise guidance; adds guidance for flight below 10,000 MSL; clarifies formation deconfliction contracts; authorizes manual extension of trailing edge flaps for Air Sovereignty tasked missions and low/slow VID training; restricts use of data link fuel status for fuel checks; adds night G-awareness, adds IFF/SIF and fuel conservation guidance, updates night lighting requirements, rewords formation and deconfliction responsibilities.

Chapter 1—GENERAL GUIDANCE	6
1.1. General.	6
1.2. Waivers.	6
1.3. Processing Changes.	6
Chapter 2—MISSION PLANNING	7
2.1. Responsibilities.	7
2.2. General Procedures.	7
2.3. Map/Chart Preparation.	7
2.4. Briefing/Debriefing.	7
2.5. Unit Developed Checklists/Local Pilot Aids/Forms.	8
2.6. G-suit/Combat Edge Use.	9
2.7. Fuel Conservation.	9
Chapter 3—NORMAL OPERATING PROCEDURES	10
3.1. Ground Communications.	10
3.2. Ground Visual Signals.	10
3.3. Ground Operations.	10
3.4. Flight Lineup.	10
3.5. Before Takeoff Checks.	10
3.6. Takeoff.	10
3.7. Formation Takeoff:	11
3.8. Join-up/Rejoin.	11
3.9. Formation, Visual and Administrative:	11
3.10. Tactical Formation.	13
3.11. Chase Formation.	13
3.12. Aerial Demonstrations.	14

	3.13.	Maneuvering Parameters.	14
	3.14.	Ops Checks.	14
	3.15.	Radio Procedures.	15
	3.16.	General Low Altitude Procedures.	16
	3.17.	Air Refueling.	16
	3.18.	Night Procedures.	16
	3.19.	Night Vision Goggles (NVG) Procedures.	18
	3.20.	Fuel Requirements.	19
	3.21.	Approaches and Landings.	19
	3.22.	Overhead Traffic Patterns.	20
	3.23.	Tactical Overhead Traffic Patterns.	20
	3.24.	Touch-and-Go Landings.	20
	3.25.	Low Approaches.	21
	3.26.	Closed Traffic Patterns.	21
	3.27.	Formation Approaches.	21
	3.28.	After Shutdown Procedures.	22
	3.29.	Identification Friend or Foe/Selective Identification Feature (IFF/SIF).	22
	3.30.	Weather Minimums.	22
Table	3.1.	Weather Minimum Summary (Feet/NM/KM).	22
	3.31.	Summary of Minimum Altitudes.	22
Table	3.2.	Minimum Altitude Summary (in Feet AGL).	22
Chapter 4—INSTRUMENT PROCEDURES			24
	4.1.	Approach Category.	24
	4.2.	Takeoff and Join-up.	24
	4.3.	Trail Procedures.	24
	4.4.	Formation Break-up.	27
	4.5.	Formation Penetration.	27
	4.6.	Formation Approach.	27
	4.7.	Simulated Instrument Flight.	27
Chapter 5—AIR-TO-AIR WEAPONS EMPLOYMENT			28
	5.1.	References.	28
	5.2.	Simulated Gun Employment.	28
	5.3.	Maneuvering Limitations.	28

5.4. Aerial Gunnery Tow Procedures.	28
Chapter 6—AIR-TO-SURFACE WEAPONS EMPLOYMENT	29
6.1. References.	29
6.2. Simulated Off-Range Weapons Employment While Carrying A/G Ordnance.	29
6.3. Weather Minimums.	29
6.4. Night Weapons Delivery/Range Operations.	29
6.5. Target Identification.	29
6.6. Live Ordnance Procedures.	29
Chapter 7—ABNORMAL OPERATING PROCEDURES	31
7.1. General.	31
7.2. Ground Aborts.	31
7.3. Takeoff Aborts.	31
7.4. Air Aborts.	31
7.5. Engine Malfunctions.	32
7.6. Radio Failure.	32
7.7. Severe Weather Penetration.	33
7.8. Lost Wingman Procedures.	33
7.9. Spatial Disorientation (SD).	34
7.10. Armament System Malfunctions.	35
7.11. Post Arresting Gear Engagement Procedures.	36
7.12. In-flight Practice of Emergency Procedures.	36
7.13. Search and Rescue (SARCAP) Procedures.	37
Chapter 8—LOCAL OPERATING PROCEDURES	38
8.1. General.	38
8.2. If Applicable Procedures.	38
8.3. Distribution of Local Supplements.	39
8.4. Forms Adopted.	39
Attachment 1—GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION	40
Attachment 2—CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND HIGH YIELD EXPLOSIVE (CBRNE) OPERATIONS	44
Attachment 3—GENERAL & SPECIAL SUBJECT BRIEFING GUIDE	46
Attachment 4—ADVANCED HANDLING/INSTRUMENT BRIEFING GUIDE	49

Attachment 5—AIR REFUELING BRIEFING GUIDE	50
Attachment 6—ADVERSARY COORDINATION	52
Attachment 7—GCI/AWACS AND TACTICAL INTERCEPTS BRIEFING GUIDE	55
Attachment 8—ESCORT MISSION BRIEFING GUIDE	58
Attachment 9—OFFENSIVE COUNTER-AIR SURFACE ATTACK / DEAD	60
Attachment 10—AERIAL GUNNERY TOW COORDINATION BRIEFING GUIDE	62
Attachment 11—AERIAL GUNNERY BRIEFING GUIDE	64
Attachment 12—LOW-LEVEL NAVIGATION BRIEFING GUIDE	66
Attachment 13—AIR DEFENSE/ALERT BRIEFING GUIDE	68
Attachment 14—NVG BRIEFING GUIDE	71
Attachment 15—GROUND CREW BRIEFING GUIDE	73
Attachment 16—MISSION DEBRIEFING GUIDE	74

Chapter 1

GENERAL GUIDANCE

1.1. General. This instruction, in conjunction with other governing directives, prescribes procedures for operating F-22A aircraft under most circumstances. It is not a substitute for sound judgment. Procedures not specifically addressed may be accomplished if they enhance safe and effective mission accomplishment.

1.1.1. **Deviations.** Deviations from these procedures require specific waiver unless an urgent requirement or an aircraft emergency dictate otherwise. In that case, the pilot in command will take the appropriate action to safely recover the aircraft.

1.1.2. **Supplements.** Develop supplements IAW AFI 33-360, *Publications and Forms Management*.

1.2. Waivers. Forward waiver requests through appropriate channels to the applicable MAJCOM/A3 or equivalent, or COMAFFOR for those aircrew and assets under the COMAFFOR's oversight, for approval. The COMAFFOR will notify HQ ACC/A3 of waivers within 72 hours of issuance.

1.3. Processing Changes.

1.3.1. Refer recommended changes and questions about this publication through to the Office of Primary Responsibility (OPR) via AF Form 847, *Recommendation for Change of Publication*, using procedures in AFI 11-215, *USAF Flight Manuals Program (FMP)* and any supplements to AFI 11-215.

1.3.2. HQ ACC/A3 will coordinate all changes to the basic volume with all MAJCOM/A3s.

Chapter 2

MISSION PLANNING

2.1. Responsibilities. The pilot in command of each aircraft and the designated flight lead are ultimately responsible for mission planning. The operations and intelligence functions will provide supplemental planning material and information as required to effectively accomplish the assigned mission.

2.2. General Procedures.

2.2.1. Accomplish sufficient flight planning to ensure safe mission accomplishment to include fuel requirements, map preparation, communication plan, and takeoff/landing data.

2.2.2. **Standards.** The SQ/CC is the approval authority for squadron standards. Group/Wing standards may be published and approved by the OG/CC. All standards will be reviewed by Wing Stan/Eval (OGV) for standardization and compliance with AFI 11-series guidance.

2.3. Map/Chart Preparation.

2.3.1. **Local Area Maps.** A local area map is not required if the unit pilot aid includes jettison areas, divert information, controlled bailout areas, and provides a local area map of sufficient detail to remain within assigned training areas.

2.3.2. **Charts.** FLIP enroute charts may be used instead of maps on navigational flights within areas that are adequately covered by these charts.

2.3.3. **Low Altitude Maps.** Reference AFI 11-217 Vol 2 *Visual Flight Procedures* for Low Altitude Map requirements and procedures.

2.4. Briefing/Debriefing.

2.4.1. **Briefings.** Flight leads are responsible for presenting a logical briefing that will promote safe, effective mission accomplishment. All pilots will attend the flight briefing unless previously coordinated with unit/squadron supervisors.

2.4.1.1. Items published in AFIs, AFTTPs, or squadron/wing standards and understood by all participants may be briefed as "standard." Specific items not pertinent to the mission do not need to be covered.

2.4.1.2. Takeoff and landing data (TOLD) will be annotated on mission data cards. The minimum TOLD required is maximum abort speed (include wet as applicable based on location and potential for wet runway surface), takeoff distance and speed, rotation speed, and normal/heavy weight landing distance (include wet as applicable based on location and potential for wet runway surface).

2.4.1.3. Review takeoff data, and ensure every member of the flight understands it. Place particular emphasis on takeoff and abort factors during abnormal situations such as short/wet runway, heavy gross weights, non-standard cable configurations.

2.4.1.4. When dissimilar aircraft are flown in formation, brief flight responsibilities, proper formation position (to ensure adequate wingtip clearance), and aircraft-unique requirements and emergency considerations for each phase of flight.

2.4.1.5. For all low altitude mission briefings, place emphasis on obstacle/ground avoidance, altitude-warning features (low altitude warning) low altitude comfort level, and complacency avoidance.

2.4.1.6. Flight leads will ensure briefing start time provides adequate time to discuss required briefing items depending on complexity of the mission and pilot capabilities. As a minimum, begin briefings at least 1.5 hours before scheduled takeoff. Alert briefings will start in sufficient time to be completed prior to pilot changeover.

2.4.1.7. Structure the flight briefing to accommodate the capabilities of each flight member.

2.4.1.8. Brief an appropriate alternate mission for each flight. The alternate mission will be less complex than the primary and should parallel the primary mission. If alternate mission does not parallel the primary mission, specific mission elements different than the primary mission should be briefed. Mission elements/events may be modified and briefed airborne as long as flight safety is not compromised. Flight leads will ensure all flight members acknowledge changes. Do not fly un-briefed missions/events.

2.4.1.9. On multiple-go days when aircraft turn times do not allow follow-on mission brief(s) and only the initial flight brief is accomplished for all goes, the following guidance applies:

2.4.1.9.1. Upgrade missions will be flown on the first sortie (second sortie if the first is non-effective for weather, airspace, or maintenance). Subsequent missions will be of equal or less complexity with no additional upgrade training without OG/CC approval.

2.4.1.9.2. Participants in continuation training missions may fly their primary or alternate missions in any sequence.

2.4.1.10. All missions will be debriefed.

2.4.2. **Deployed Operations, Exercise, and Quick Turn Briefings.** If all flight members attend an initial or mass flight briefing, the flight lead on subsequent flights need brief only those items that have changed from the previous flight(s).

2.4.3. **Briefing Guides.** Briefing guides will be used to provide the flight lead/briefer with a reference list of items which may apply to particular missions. Items listed in [Attachment 2](#) may be briefed in any sequence. Those items published in AFIs, AFTTPs, or squadron/wing standards may be briefed as “standard”. Units may augment these guides as necessary. Pending development by a higher headquarters, units that fly missions not covered by this instruction or its supplements will develop briefing guides for those missions and submit them to MAJCOM Stan/Eval for review.

2.5. Unit Developed Checklists/Local Pilot Aids/Forms.

2.5.1. Unit developed checklists may be used in lieu of flight manual checklists (except -25 checklists) provided they contain, as a minimum, all items (verbatim and in order) listed in the applicable checklist. These checklists will reflect the same change number, change date and applicable supplement numbers as the flight crew checklist for configuration control.

2.5.2. Units will produce a pilot aid that, as a minimum, includes:

2.5.2.1. Briefing Guides.

2.5.2.2. Local radio channelization and airfield diagrams.

2.5.2.3. Impoundment procedures, emergency action checklists, NORDO/divert information, and search and rescue procedures.

2.5.2.4. Arresting gear information for divert bases.

2.5.2.5. Bailout and Jettison Areas.

2.5.2.6. Cross-country procedures to include: command and control, engine documentation, JOAP samples, and aircraft servicing.

2.5.2.7. Other information as deemed necessary by the units. For example: stereo flight plans, turnaround procedures, local training areas, instrument pre-flight, and alert procedures.

2.6. G-suit/Combat Edge Use. IAW AFI 11-301 Vol. 1, *Aircrew Flight Equipment (AFE)* Program, the following apply:

2.6.1. G-suit is required on all flights when 2 or more Gs are anticipated.

2.6.2. COMBAT EDGE (CE) is required on every sortie. Exception(s): CE is not required on cross country, ferry or 411 FLTS sorties unless flight above FL 440 and/or 6Gs is anticipated.

2.7. Fuel Conservation. Manage aviation fuel as a limited commodity and precious resource. Design procedures for optimal fuel use and efficiencies throughout all phases of mission execution, to include ground operations, flight plans, power settings and climb/descent profiles. Incorporate enroute tasks to make maximum use of airborne learning opportunities.

Chapter 3

NORMAL OPERATING PROCEDURES

3.1. Ground Communications. The pilot will accomplish the ground crew briefing (when required) in accordance with the briefing guide contained in this instruction. Normally, the pilot and ground crew will communicate using the intercom during all engine start and pre-taxi checks. Use the intercom system, to the maximum extent possible, anytime aircraft engines are operating and maintenance technicians are performing tasks on the aircraft. Units with active air defense commitments may waive the use of intercom during alert scrambles.

3.2. Ground Visual Signals. When ground intercom is not used, use visual signals IAW AFI 11-218, *Aircraft Operations and Movement on the Ground*, and this instruction. All signals pertaining to operation of aircraft systems will originate with the pilot. The crew chief will repeat the given signals when it is safe to operate the system. The pilot should not activate any system that could pose danger to the ground crew prior to receiving proper acknowledgment from ground personnel. The following signals augment AFI 11-218.

3.2.1. **APU START.** With clenched fist, pilot makes a pulling motion.

3.2.2. **FLIGHT CONTROLS CHECK.** Raise arm, clench fist, and make a stirring action.

3.2.3. **LOSS OF BRAKES WHILE TAXIING.** Lower tailhook.

3.2.4. **GUN ARMAMENT CHECK.** Point index finger forward with thumb upward simulating a pistol and shake head (yes or no).

3.3. Ground Operations.

3.3.1. The minimum taxi interval is 150 feet staggered or 300 feet in trail. Spacing may be reduced when holding short of or entering the runway.

3.3.2. Do not taxi during snow and/or icy conditions until the taxi route and runway have been checked for safe conditions. In this case, taxi on the centerline with a minimum of 300 feet spacing.

3.3.3. Keep hands in view of ground personnel during quick check, arming or de-arming operations. If the intercom system is not used during EOR checks, the pilot will establish and maintain visual contact with the ground personnel to allow the use of visual signals.

3.3.4. Do not taxi in front of aircraft being armed/de-armed with forward firing ordnance.

3.4. Flight Lineup. Flights will line up as appropriate based on weather conditions, runway conditions, and runway width. Use a minimum of 500 feet spacing between separated elements/flights. If runway width precludes line-up with wingtip clearance between all aircraft in the flight, use 500 feet spacing between elements or delay run-up until the preceding aircraft/element releases brakes.

3.5. Before Takeoff Checks. Just prior to takeoff, all flight members will inspect each other for proper configuration and any abnormalities.

3.6. Takeoff.

3.6.1. Do not takeoff if the RCR is less than 12.

3.6.1.1. Per MAJCOM guidance, OG/CC may waive RCR minimum for specified units operating in cold weather locations, but in no case will takeoffs be conducted with an RCR of less than 8.

3.6.2. On training missions do not takeoff if the computed takeoff roll exceeds 80 percent of the available runway. For takeoffs, if the computed military power takeoff distance exceeds one-half of the available runway, takeoff using afterburner.

3.6.3. When operating from airfields equipped with a compatible, remotely operated cable, ensure the departure end cable is raised for all takeoffs and landings, unless another departure end cable is in place.

3.6.4. Use a minimum of 10 seconds (15 seconds when using afterburners) takeoff interval between aircraft. Sensor Trail Departures will use 20 seconds takeoff interval.

3.6.5. Aircraft will steer toward the center of the runway at the start of the takeoff roll.

3.6.6. During rolling takeoffs, align the aircraft with the runway heading prior to advancing the throttles.

3.6.7. Wing/Group Commander or Ops Group Commander may approve intersection takeoffs if operational requirements dictate.

3.6.8. Do not take off with the SES LOW ICAW displayed.

3.7. Formation Takeoff: Not Authorized

3.8. Join-up/Rejoin.

3.8.1. Day weather criteria for a VFR join-up underneath: ceiling 1,500 feet and visibility 3 miles.

3.8.2. Flight leaders will maintain 350 KCAS until join-up is accomplished unless mission requirements necessitate a different airspeed.

3.8.3. Flight leaders should limit their angle of bank to 30 degrees for turning rejoins immediately after takeoff.

3.8.4. Flight members will join in sequence. For a straight-ahead rejoin, the number two aircraft will join on the left wing and the second element will join on the right wing. For a turning rejoin, the number two aircraft will rejoin on the inside of the turn and the element to the outside. If mission or flight requirements dictate, the flight leader will specifically direct the desired formation positions.

3.8.5. **Battle Damage Checks.** When circumstances permit, flight leads will direct a battle damage check after each mission prior to or during RTB. Except at night/IMC, this check is mandatory following the expenditure of any ordnance (including all types of 20mm ammunition). Brief deconfliction responsibilities and position change procedures. Fly no closer than fingertip formation spacing.

3.8.6. For further join-up procedures, see Night Joinup (3.18.3) and Chapter 4.

3.9. Formation, Visual and Administrative: IP/flight leads are responsible for ensuring contracts, roles and responsibilities of each flight member are established, briefed, executed and debriefed. If any flight member cannot fulfill their basic responsibilities, contracts, or other

assigned tasks, they will immediately communicate that information to the flight/element lead. IP/flight leads will task element leads/wingmen based on their ability to fulfill basic responsibilities and other assigned tasks. For additional formation considerations, reference AFTTP 3-3.F-22 and AFTTP 3-1.F-22.

3.9.1. In IMC, the maximum flight size in close/route formation is four aircraft except when flying in close formation with a tanker.

3.9.2. Do not use rolling maneuvers to maintain or regain formation position below 5,000 feet AGL or in airspace where aerobatics are prohibited.

3.9.3. Airborne visual signals will be in accordance with AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*. For four-ship flights, configuration changes will be initiated by radio call, when practical. When formation position changes are directed by radio, all wingmen will acknowledge prior to initiating the change. A radio call is mandatory when directing position changes at night or under instrument conditions.

3.9.4. For non-tactical portions of a sortie (i.e. navigation to/from airspace) flight leaders will not break up formations until each wingman has a fix from which to navigate (visual, radar, operational GINS, received TACAN or received ILS in the appropriate steering mode).

3.9.5. **Changing Leads.**

3.9.5.1. When flying in limited visibility conditions, initiate lead changes from a stabilized, wings level attitude.

3.9.5.2. The minimum altitude for a lead change is 500 feet AGL over land or 1,000 feet AGL over water (for night see paragraph 3.18.4).

3.9.5.3. Do not initiate lead changes (unless in fingertip or route) with the wingman further aft than 30 degrees from line abreast.

3.9.5.4. Flight/element leads will not initiate a lead change from a *visual* formation unless the aircraft assuming the lead is in visual contact and in a safe position to do so.

3.9.5.5. Initiate a lead change by visual signal or radio call.

3.9.5.6. Acknowledge receipt of the lead by head nod or radio call, as appropriate.

3.9.5.7. A lead change is effective upon acknowledgment.

3.9.5.8. The former leader then moves to the appropriate wing position.

3.9.6. **Visual Formation Maneuvering.**

3.9.6.1. Flight/element leads will consider wingman/element position and ability to safely perform a maneuver before directing it from a visual formation.

3.9.6.2. Wingmen/elements must maneuver relative to the flight lead/lead element and maintain sight. Trailing aircraft/elements are responsible for deconflicting with lead aircraft/elements.

3.9.6.3. Wingmen/elements will cross above the lead/lead element when deconfliction is required in the low altitude environment.

3.9.6.4. **Loss of Visual.** Use the following procedures when one or more flight members/elements lose visual contact while flying a visual formation:

- 3.9.6.4.1. When any flight member/element is Blind, they will call "Blind" with altitude ("Blind, 24.5"). The appropriate flight member/element will immediately respond with "Visual" and a position report or "Blind."
- 3.9.6.4.2. When the other flight member/element is also "Blind," that pilot will immediately deconflict from the altitude called and will transmit his own altitude as an immediate action to deconflict flight paths. The flight lead will ensure a minimum of 1000 feet altitude separation is maintained. Avoid climbs/descents through the deconfliction altitude.
- 3.9.6.4.3. When there is not a timely acknowledgment of the original "Blind" call, then the flight member/element initiating the call will maneuver away from the last known position of the other flight member/element and alter altitude.
- 3.9.6.4.4. If visual contact is still not regained, the flight leader will take additional positive action to ensure flight path deconfliction within the flight to include a Terminate/Knock-It-Off call if necessary. Consider scenario restrictions such as sanctuary altitudes and/or adversary blocks.
- 3.9.6.4.5. Aircraft will maintain altitude separation until a visual is regained and, if necessary, will navigate with altitude separation until mutual support is regained.
- 3.9.6.5. Two-Ship Visual Formation Deconfliction.** The following rules apply for flight path deconfliction in 2-ship visual formations:
- 3.9.6.5.1. Normally, the wingman is responsible for flight path deconfliction.
- 3.9.6.5.2. The flight lead becomes responsible for deconfliction when:
- 3.9.6.5.2.1. Maneuvering places the leader well aft of the wingman's 3/9 line or forces the wingman's primary attention away from the leader.
- 3.9.6.5.2.2. The wingman calls "padlocked."
- 3.9.6.5.2.3. The wingman calls "blind."
- 3.9.6.5.2.4. Primary deconfliction responsibility transfers back to the wingman once the wingman acknowledges a visual on his lead.
- 3.9.6.6. Three/Four-Ship (or greater) Visual Formation Deconfliction.** When flights of more than two aircraft are in Visual formation:
- 3.9.6.6.1. Formation visual signals performed by a flight/element leader pertain only to the associated element unless specified otherwise by the flight leader.
- 3.9.6.6.2. Trailing aircraft/element(s) will maintain sufficient spacing so that primary emphasis during formation maneuvering/turns is on deconfliction within elements, not on deconfliction between elements.

3.10. Tactical Formation. Reference AFTTP 3-1.F22 for Tactical Formation deconfliction and flight-member responsibilities.

3.11. Chase Formation.

- 3.11.1. **Restrictions.** Any pilot may fly safety chase for aircraft under emergency or impending emergency conditions. Qualified pilots (including IQT/MQT pilots who have

successfully completed an Instrument/Qualification evaluation) may chase as safety observer for aircraft performing simulated instrument flight or hung ordnance patterns. Specialized missions (i.e., DT&E, OT&E, WSEP, live weapons delivery, etc.) and training conducted IAW AFI 11-2F-22A, Volume 1, *F-22A Aircrew Training*, may be chased by CMR/BMC pilots designated by Group/Squadron Commanders. All other chase events may only be flown by IP/FEs or upgrading IPs under the supervision of an IP.

3.11.2. Procedures:

3.11.2.1. A safety observer in a chase aircraft, except IP/FE/specialized mission chase, will maneuver in a 30-60 degree cone with nose/tail clearance to 1,000 feet, to effectively clear and/or provide assistance.

3.11.2.2. IP/FE/specialized mission aircraft will maneuver as necessary, but must maintain nose/tail separation until required to transition to close formation when deemed necessary by the IP/FE.

3.11.2.3. No chase aircraft will stack lower than the lead aircraft when below 1,000 feet AGL.

3.12. Aerial Demonstrations. Brief and fly show formations as approved. Refer to AFI 11-209, *Aerial Events Policy and Procedures*, and applicable MAJCOM directives for specific rules and appropriate approval levels to participate in static displays and aerial events IAW AFI 11-246 Vol 1, *Air Force Aircraft Demonstrations* (A-10, F-15, F-16, F-22).

3.13. Maneuvering Parameters.

3.13.1. **Minimum Altitudes.** For aerobatics, remain above 5,000 feet AGL. During nose high/low speed and AHC vertical maneuvering ensure maneuvers are terminated to allow recovery above 5,000 feet AGL.

3.13.2. Avoid flight through wingtip vortices and jet wash. If it is unavoidable, immediately unload the aircraft to approximately 1 G.

3.14. Ops Checks.

3.14.1. Accomplish sufficient ops checks to ensure safe mission accomplishment. Ops checks are required:

3.14.1.1. During climb or at level off after takeoff.

3.14.1.2. Prior to each (D)ACBT engagement or intercept.

3.14.1.3. Following Air Refueling.

3.14.2. Minimum items to check are ICAWS messages, total fuel, G-suit connection, oxygen system, cabin altitude, and HUD max G indicator.

3.14.3. For formation flights, the flight leader may initiate ops checks by radio call or visual signal and wingmen will respond appropriately.

3.14.3.1. The query and response for ops checks will include total fuel amount as read on the Standby Flight Group (SFG). If wingmen are within 500 lbs. of the flight lead, a "same" call may be used.

3.14.3.2. When external tanks are feeding, add a "tanks feeding" call to the normal Ops Check reply. Make a "tanks dry" call once the external tanks are confirmed dry. Once the "tanks dry" call has been made, no further reference to tanks need be made on subsequent Ops Checks.

3.14.4. **G-awareness Exercise** - Reference AFI 11-214 and AFTTP 3-3.F-22A. Unless performing a syllabus required event (e.g. chase of a G-awareness exercise), flight members will maintain a minimum of 6,000 feet separation between aircraft during the execution of all G-awareness exercises. On board systems (e.g. air-to-air TACAN, Radar, IFDL) should be used to establish separation prior to maneuver execution. During maneuver execution use visual lookout and briefed formation contracts as primary means of ensuring aircraft deconfliction. If required, use on board systems to enhance situational awareness during the maneuver.

3.14.4.1. Flight/element leads will ensure the airspace intended for conducting the G-awareness exercise is free from potential traffic conflicts. Use Air Traffic Control (ATC) services to the maximum extent practical to make sure the airspace is clear. Conduct the G-awareness exercise in the following airspace with preference to the order listed below:

3.14.4.1.1. Special Use Airspace (e.g. Restricted/Warning areas, Air Traffic Control Assigned Airspace (ATCAA), MOAs and MAJCOM approved large scale exercise/special mission areas).

3.14.4.1.2. Above 10,000 MSL outside of special use airspace

3.14.4.1.3. Inside the confines of a Military Training Route (MTR)

3.14.4.1.4. Below 10,000 feet MSL outside of special use airspace

3.14.4.2. Flight/element leads flying outside of CONUS will follow gaining MAJCOM, theater or host nation guidance on airspace in which G-awareness exercises may be performed. If no gaining MAJCOM, theater, or host nation guidance is available, follow the guidance in section [3.14.4.1](#) to the maximum extent practical.

3.15. Radio Procedures.

3.15.1. Preface all communications with the complete flight call sign unless excepted below. Transmit only that information essential for mission accomplishment or safe flight. Use visual signals when practical.

3.15.2. Acknowledge radio checks that do not require the transmission of specific data by individual flight members in turn (Example: "2, 3, 4"). Acknowledgment indicates the appropriate action is complete, in the process of being completed, or the flight member understands.

3.15.3. In addition to the radio procedures outlined in AFI 11-202 Volume 3, Specific Mission Guides, and FLIP publications, the following radio transmissions are required:

3.15.3.1. All flight members will acknowledge understanding the initial ATC clearance. Acknowledge subsequent ATC instructions when directed by the flight lead, or anytime during trail departures as detailed in paragraph 4.3.

3.15.3.2. Each pilot will report gear down on base leg, or, if making a VFR straight in approach, no later than 3 miles on final. When flying an instrument approach, report gear

down in response to ATC instructions or no later than the final approach fix or glide path intercept point. A wingman or chase need not make this call during a formation or chased approach.

3.16. General Low Altitude Procedures.

3.16.1. Fly low level formation positions/tactics using AFTTP 3-1.F-22 and AFTTP 3-3.F-22, *Combat Aircraft Fundamentals* as guides.

3.16.2. Line abreast formation is authorized at or above 500 feet AGL.

3.16.3. During briefings emphasize low altitude flight maneuvering and observation of terrain features/obstacles in the low altitude training area. For low altitude training over water/featureless terrain, include specific considerations with emphasis on minimum altitudes and spatial disorientation.

3.16.4. All obstacle avoidance planning for Low Altitude Map requirements will be IAW AFI 11-217 Vol 2 *Visual Flight Procedures*.

3.16.5. At altitudes below 1,000 feet AGL, wingmen will not fly at a lower AGL altitude than lead.

3.16.6. When crossing high or hilly terrain maintain positive G and do not exceed approximately 120 degrees of bank. Maneuvering at less than 1G is limited to upright bunting maneuvers.

3.16.7. The minimum airspeed for Air Defense and Low/Slow VID procedures is 12 degrees AOA. The minimum airspeed for low-level navigation is 300 KCAS for.

3.16.8. Minimum airspeed during low altitude offensive or defensive maneuvering (< 5000' AGL) is 350 KCAS.

3.16.9. **Minimum Altitudes.** The unit commander will determine and certify pilots' minimum altitude IAW AFI 11-2F-22A Volume 1, as supplemented. Flight members participating in approved step-down training programs will comply with the requirements and restrictions of that program. The following minimum altitudes apply to low altitude training unless national rules or a training syllabus specifies higher altitudes:

3.16.9.1. 500 feet AGL for: LOWAT Category I qualified pilots.

3.16.9.2. For night (non-NVG) or IMC operation, the minimum altitude is 1000 feet above the highest obstacle within 5 NM of aircraft position.

3.16.10. During all low altitude operations, the immediate reaction to task saturation, diverted attention, knock-it-off, or emergencies is to climb to a pre-briefed safe altitude (minimum 1000 feet AGL).

3.16.11. Weather minimums for visual low level training are 1,500 feet ceiling and 3 miles visibility for any area, or unit regulations or national rules, whichever is higher.

3.17. Air Refueling. Pilots undergoing initial/recurrency training in air refueling will not refuel with a student boom operator (does not apply to KC-10). Pilots will inform boom operators when refueling from a particular tanker type (KC-10 or KC-135) for the first time.

3.18. Night Procedures.

3.18.1. Night Lighting Requirements

3.18.1.1. **Wingtip position lights:** Only one position light on each wing is required. However, if each wing only has one light, they must be on opposite sides; one upper, one lower (ex: top left, bottom right).

3.18.1.2. **Landing and Taxi Lights:** The landing light must be operational prior to takeoff. If the Taxi light is not operational, the landing light must provide sufficient lighting to allow safe taxi. The taxiing aircraft will come to a stop if the area cannot be visually cleared without the taxi light.

3.18.1.3. **Anti-collision light (white strobe):** One operational Anti-collision light (ANTI-COLL/BRT) is required for night operations (ground and air). The Anti-collision light can be turned off if it causes distraction to the pilot. If the Anti-collision light is turned off while outside operational airspace, then at least one aircraft within a standard formation must have POSN/ANTI-COLL switch in the FLASH setting. Position Lights in the FLASH setting meet 11-202 Vol 3 requirements for anti-collision.

3.18.2. Night Ground Operations.

3.18.2.1. When ground personnel are working under the aircraft, the POSN/ANTI-COLL switch will be placed in BRT (position lights 100%, steady, anti collision light off).

3.18.2.2. Taxi on the taxiway centerline with a minimum of 300 feet spacing.

3.18.2.3. Use the taxi light while taxiing unless it might interfere with an aircraft landing or taking off. The taxiing aircraft will come to a stop if the area cannot be visually cleared without the taxi light.

3.18.2.4. For taxi, set the POSN/ANTI-COLL switch to FLASH.

3.18.3. **Night Takeoff.** For takeoffs, set the POSN/ANTI-COLL switch to FLASH. Following takeoff, each aircraft/element will climb on runway heading to 1,000 feet AGL before initiating turns, except where departure instructions specifically preclude compliance.

3.18.4. **Night Join-up.** Weather criteria for night join-up underneath is a ceiling of 3,000 feet and 5 miles visibility. Flight Leads will direct lighting adjustments for the flight based on environmental conditions and flight member feedback.

3.18.5. Night Formation Procedures.

3.18.5.1. When in non-visual formations at night, maintain aircraft spacing primarily by instruments, sensors/IFDL, and/or timing. If aircraft spacing cannot be ensured, establish altitude separation (1,000 feet minimum). Crosscheck instruments at all times to ensure ground clearance.

3.18.5.2. Do not change lead or wing formation positions below 1,500 feet AGL unless on RADAR downwind. Direct lead and position changes using the radio and from a stabilized, wings-level attitude.

3.18.5.3. Night Formation Parameters. References and Parameters for night formation positions are specified in AFTTP 3-3.F22.

3.18.6. **Night Break-up.** Prior to a formation break-up at night, the flight leader will transmit attitude, altitude, airspeed, and altimeter setting, which will be acknowledged by

wingmen. Wingmen will confirm their onboard systems required for independent night navigation are functional (GINS, CNI).

3.18.7. **Night Landing.** Normally land from an instrument straight-in approach. Refer to AFI 11-202 Volume 3, as supplemented for specific procedures.

3.19. Night Vision Goggles (NVG) Procedures.

3.19.1. USAF/MAJCOM guidance (including AFI 11-202 Volume 3, and AFI 11-214) outline NVG procedures. AFTTP 3-1 and AFTTP 3-3 will incorporate expanded tactical guidance. Additionally:

3.19.1.1. NVGs will only be worn by qualified flight members or when upgrading with NVGs with a qualified NVG instructor in the flight.

3.19.1.2. Flight leads will brief the appropriate time to don/doff goggles for the sortie. Pilots will ensure deconfliction while donning/doffing goggles.

3.19.1.3. When operating in a visual formation outside of NVG Route, more frequent crosscheck of instruments will be made (approximately every 4-6 seconds) to reduce possibility of spatial dis/mis-orientation.

3.19.1.4. Flight Leads will brief the appropriate NVG-compatible formation lighting levels for each flight member to set.

3.19.2. NVGs must be preflight tested and adjusted by the pilot in the unit eyeline prior to NVG operations. NVGs will be stowed or raised until at least 2,000 feet AGL in climbing or level flight. Stow or raise NVGs no later than 5 minutes prior to landing unless NVGs are necessary to handle an emergency.

3.19.3. With NVGs, pilots may operate below the RAA/MSA down to a minimum of 1,000 ft AGL during high-illumination (HI) periods (as defined by AFI 11-214). The flight lead or individual pilot is the final authority to assess actual illumination for a particular mission element, based on visibility and terrain features/resolution.

3.19.4. NVGs may be worn for night tanker rejoins, but will be raised or stowed no later than the stern position.

3.19.5. Unless required for battle damage checks or aircraft assistance, wingmen wearing NVGs will fly no closer than route formation.

3.19.6. **NVG Battle Damage Checks.** If executed, fly no closer than parameters for route formation with NVGs (as defined in AFTTP 3-3.F-22).

3.19.7. **In-flight Emergencies with NVGs.** During in-flight emergencies, immediately assess whether the NVGs aid or hinder completing emergency procedures. If they are a hindrance or the emergency may deteriorate into an ejection situation, remove and stow the NVGs.

3.19.8. Abnormal Procedures.

3.19.8.1. **Lost sight.** If you lose sight within a visual formation, execute appropriate lost wingman procedures. Consider highlighting position by increasing exterior lighting level, activating the afterburners, or deploying chaff/flares as airspace allows.

3.19.8.2. **NVG failure.** Ensure separation from other aircraft and the ground before attempting to remedy the NVG failure.

3.19.8.2.1. Transition to instruments.

3.19.8.2.2. Perform lost wingman procedures if appropriate.

3.19.8.2.3. Route abort/climb above MSA if appropriate.

3.19.8.2.4. Terminate/KIO as applicable.

3.19.8.2.5. If other aircraft are in the vicinity, direct them to raise their external lights to non-NVG visible levels.

3.19.8.2.6. Attempt to regain NVG operation by switching to the opposite battery. Once clear of other aircraft and terrain, change the battery. If these steps do not solve the problem, stow NVGs and proceed with non-NVG plan.

3.19.8.3. Inadvertent flight into weather. Encountering poor weather conditions during NVG operations may cause loss of SA and aircrew distraction/disorientation.

3.19.8.3.1. Single ship or separated from flight members:

3.19.8.3.1.1. Transition to instruments.

3.19.8.3.1.2. Route abort if LOWAT, otherwise climb/descend to VMC.

3.19.8.3.1.3. Terminate/KIO as applicable.

3.19.8.3.2. **Formation flight.** If entering weather in formation or close proximity to other aircraft, perform the first five steps under NVG failure ([para 3.19.8.2](#)), as appropriate, then climb/descend to attempt to regain VMC.

3.20. Fuel Requirements.

3.20.1. **Joker Fuel.** A pre-briefed fuel needed to terminate an event and proceed with the remainder of the mission.

3.20.2. **Bingo Fuel.** A pre-briefed fuel state that allows the aircraft to return to the base of intended landing or alternate, if required, using preplanned recovery parameters and arriving with normal recovery fuel as listed below.

3.20.3. **Normal Recovery Fuel.** The fuel on initial or at the FAF at the base of intended landing or alternate, if required. Fuel quantity will be as established locally or 2,500 pounds, whichever is higher.

3.20.4. Declare the following when it becomes apparent that an aircraft may land at the intended destination or alternate, if required, with:

3.20.4.1. **Minimum Fuel.** 1,800 pounds or less. This is based on 20 minutes reserves at 30K' MSL flying max endurance airspeed (fulfilling AFI 11-202v3 fuel reserve requirements).

3.20.4.2. **Emergency Fuel.** 1,200 pounds or less.

3.21. Approaches and Landings.

3.21.1. The desired touchdown point for a VFR approach is 500-1000 feet from the threshold or the glideslope interception point for a precision approach. When local procedures or unique conditions require landing beyond the normal touchdown point, adjust the touchdown point accordingly.

3.21.2. Minimum pattern and touchdown spacing between landing aircraft is 3,000 feet for similar aircraft (e.g. F-22A versus F-22A), 6,000 feet for dis-similar aircraft (e.g. F-22A versus F-16) or as directed by MAJCOM or the landing base, whichever is higher. Increase spacing whenever wake turbulence is anticipated.

3.21.3. Normally, all aircraft will land in the center of the runway and clear to the turnoff (cold) side of the runway when speed/conditions permit.

3.21.4. Landing Restrictions.

3.21.4.1. When the computed landing roll exceeds 80 percent of the available runway, land at an alternate if possible.

3.21.4.2. Do not land over any raised web barrier (e.g. MA-1A, 61QSII).

3.21.4.3. When the RCR at the base of intended landing is less than 12, land at an alternate if possible. If an alternate is not available, an approach end or midfield arrestment is recommended.

3.22. Overhead Traffic Patterns.

3.22.1. Overhead patterns can be made with unexpended live/inert ordnance. This does not apply to hung or misfired ordnance (secure or unsecure).

3.22.2. Initiate the break over the touchdown point or as directed.

3.22.3. Execute individual breaks in a level 180 degree turn to the downwind leg at minimum intervals of 5 seconds (except IP/FE chase or when in tactical formation).

3.22.4. Aircraft must be wings level on final at approximately 300 feet AGL and 1 mile from the planned touchdown point.

3.23. Tactical Overhead Traffic Patterns. Tactical entry to the overhead traffic pattern is permitted when:

3.23.1. The published overhead pattern altitude and airspeed are used.

3.23.2. Specific procedures are developed and coordinated with appropriate air traffic control agencies.

3.23.3. No more than four aircraft are in the flight. Aircraft/elements more than 6,000 feet in trail are considered a separate flight.

3.23.4. No aircraft are offset from the runway in the direction of the break. The intent is to avoid requiring a tighter than normal turn to arrive on normal downwind.

3.23.5. Normal downwind, base turn positions, and spacing are flown.

3.24. Touch-and-Go Landings.

3.24.1. Fly touch-and-go landings IAW AFI 11-202 Volume 3, as supplemented by MAJCOM. Multiple touch-and-go landings may be flown to regain landing currency.

3.24.2. Do not fly touch-and-go landings with hung ordnance, live external ordnance, or with fuel remaining in any external tank.

3.25. Low Approaches.

3.25.1. Observe the following minimum altitudes:

3.25.1.1. Normal single ship low approaches - so that touchdown does not occur.

3.25.1.2. IP/FE flying chase position - 50 feet AGL.

3.25.1.3. Formation low approaches and non-IP/FE chase - 100 feet AGL.

3.25.1.4. Chase aircraft during an emergency - 300 feet AGL unless safety or circumstances dictate otherwise.

3.25.2. During go-around, remain 500 feet below VFR overhead traffic pattern altitude until crossing the departure end of the runway unless local procedures, missed approach/climbout procedures, or controller instructions dictate otherwise.

3.26. Closed Traffic Patterns. Initiate the pattern at the departure end of the runway unless directed/cleared otherwise by local procedures or the controlling agency. From a formation approach or chase position, a sequential closed may be flown with ATC concurrence at an interval to ensure proper spacing. Plan to arrive on downwind at 200-250 KCAS.

3.27. Formation Approaches.

3.27.1. **General.**

3.27.1.1. Normally accomplish formation approaches from a published instrument approach or a VFR straight-in approach using the VASI, if available. In all cases, use a rate of descent similar to a normal precision approach.

3.27.1.2. Aircraft must be within 3,000 pounds weight of each other and symmetrically loaded.

3.27.1.3. Position the wingman on the upwind side if crosswind exceeds 5 knots.

3.27.1.4. Formation Approaches will not descend below 100' AGL.

3.27.2. **Formation Landings.** Formation Landings are not authorized.

3.27.3. **Formation Drag Procedures.**

3.27.3.1. Formation drag landings are restricted to:

3.27.3.1.1. Daytime

3.27.3.1.2. Weather: 1500'/3 miles

3.27.3.1.3. Formation: two-ship maximum

3.27.3.2. When directed to take spacing, wingmen will reduce power, extend speed brake and slow to no less than 200 KCAS while achieving 1.5 to 2.5 NM spacing.

3.27.3.3. Designate the preceding aircraft as NTS.

3.28. After Shutdown Procedures. All flight members will accomplish a post flight walk-around. The intent of this inspection is to find evidence of birdstrike, lost panels, damaged ordnance, and structural damage resulting from over-Gs or other in-flight abnormalities.

3.29. Identification Friend or Foe/Selective Identification Feature (IFF/SIF). Excessive Mode 4 interrogations from the F-22 AAI (specifically from the aft) can cause civil aircraft transponders to malfunction. IAW the FAA F-22A AAI Spectrum Certification, the following procedures apply:

3.29.1. Within operational airspace, *or when required for safety or real-world missions outside operational airspace*, pilots may use full AAI system interrogation capabilities.

3.29.2. Outside operational airspace (transit to and from airspace, cross-country, etc.) and during Operation Noble Eagle CAPs (unless required for tasked intercept), pilots will use the following procedures:

3.29.2.1. If using automatic System Mode 4 Interrogations, select FWD AAI.

3.29.2.2. When making Manual Mode 4 Interrogations interrogations, place cursors within the Sensor Search Volume (SSV).

3.30. Weather Minimums. Refer to table 3.1 for a summary of weather minimums affecting F-22A operations.

Table 3.1. Weather Minimum Summary (Feet/NM/KM).

Event	Minimum
VFR Rejoin (Day)	1500 / 3NM / 4.8 KM
VFR Rejoin (Night)	3000 / 5NM / 8KM
Low Level Navigation (Day)	1500 / 3NM / 4.8KM (notes 1&2)
Low Altitude Intercepts (Day)	3000 / 5NM / 8KM (note 3)
Notes:	
1. Unless national rules are higher.	
2. 2000/8 KM in countries where the minimum altitude is 1000 feet AGL.	
3. 3500/8 KM in countries where minimum altitude is 1000 feet AGL.	

3.31. Summary of Minimum Altitudes. Refer to table 3.2 for a summary of minimum altitudes that affect F-22A operations.

Table 3.2. Minimum Altitude Summary (in Feet AGL).

Event	Minimum
Aerobatics / ACBT / AHC	5000

Lead Change	See note
Chase (Emergency)	300
Chase (FE / IP)	50
Formation Low Approach	100
Low Approaches	So as to not touchdown
KIO	1000
Note: 500 feet over land; 1000 feet over water; 1500 feet at night /IMC unless on radar downwind.	

Chapter 4

INSTRUMENT PROCEDURES

4.1. Approach Category.

4.1.1. The F-22A is Approach Category E. Accomplish missed approach IAW flight manual procedures. Missed approach airspeed is 250 KCAS.

4.1.2. Use approach Category D minimums at an emergency/divert airfield where no Category E minimums are published. Airfields with Category D minimums may be designated as an alternate (divert) airfield. Practice instrument approaches may be flown using Category D minimums if VMC can be maintained throughout the procedure. Under these circumstances, approach Category D minimums may be used provided:

4.1.2.1. A straight-in approach is flown.

4.1.2.2. The aircraft is flown at final approach airspeed of 165 KCAS or less.

4.1.2.3. The aircraft is flown at 255 knots true airspeed (KTAS) or less for the missed approach segment of the approach. At high-pressure altitudes and temperatures 255 KTAS may not be compatible with published missed approach airspeeds and Category D approaches should not be flown.

4.1.3. The F-22A's GINS is approved for enroute Area Navigation (RNAV). The enroute navigation may not exceed 1.5 hours between INS updates. An update is defined as establishing a positive position using visual, TACAN, GPS, or on-board radar. Do not fly RNAV approaches. RNAV operations in required navigation performance (RNP) airspace or using RNP procedures are not authorized. Use of RNAV "Q" or "T" designated routes is not authorized.

4.2. Takeoff and Join-up.

4.2.1. The flight lead must get an appropriate ATC clearance (altitude block or trail formation) when a flight join-up is not possible due to weather conditions or operational requirements. Formation trail departures must comply with instructions for a nonstandard formation flight as defined in FLIP.

4.2.2. If weather is below 1500 feet and 3 miles, each aircraft will climb on takeoff heading to 1,000 feet AGL before initiating any turns, except when departure instructions specifically preclude compliance.

4.3. Trail Procedures.

4.3.1. General.

4.3.1.1. During trail formations, basic instrument flying is the first priority and must not be sacrificed when performing secondary trail tasks. Strictly adhere to the briefed airspeeds, power settings, altitudes, headings, and turn points. If task saturation occurs, cease attempts to maintain trail, concentrate on flying the instrument departure, and then notify the flight lead. The flight lead will then notify air traffic control (ATC).

4.3.1.2. Flight leaders will request non-standard formation from ATC.

4.3.1.3. ATC instructions issued to the lead aircraft apply to the entire flight.

4.3.1.4. Flight leads will brief aircraft/element spacing. Minimum spacing between aircraft when in non-standard formation is 9,000 feet and will be maintained using on board systems.

4.3.1.5. If a flight member is not on IFDL, each aircraft will follow the No NTS procedures until the aircraft/element immediately in trail has established the preceding aircraft as the NTS and called "tied."

4.3.2. If Flight Member is unable to attain an NTS.

4.3.2.1. The flight leader will call when initiating all turns. Subsequent aircraft must delay turns to maintain the desired spacing.

4.3.2.2. Each aircraft/element will maintain 1.5-2.5 mile spacing using all available aircraft systems and navigational aids to monitor position.

4.3.2.3. During climbs and descents, each aircraft/element will call passing each 5,000 foot altitude increment with altitude and heading (or heading passing) until join-up, level-off, or the following aircraft/element calls "tied."

4.3.2.4. Each aircraft/element will call initiating any altitude or heading change. Acknowledgments are not required; however, it is imperative that preceding aircraft/elements monitor the radio transmissions and progress of the succeeding aircraft/elements and immediately correct deviations from the planned route.

4.3.2.5. Each aircraft/element will maintain at least 1,000 feet vertical separation from the preceding aircraft/element until establishing radar/visual contact, except in instances where departure instructions specifically preclude compliance. Reduce vertical separation to 500 feet if necessary to comply with MSA restrictions.

4.3.2.6. In the event a visual join-up cannot be accomplished on top or at level off, the flight leader will request altitude separation for each succeeding aircraft/element to meet the requirements of the above paragraph.

4.3.3. With NTS.

4.3.3.1. Each aircraft/element will call "tied" when a NTS is established with the preceding aircraft. Once all aircraft are tied, no further radio calls are required, unless contact is lost. Flight leads will ensure that wingman are aware of any unplanned or ATC directed intermediate level off altitudes.

4.3.3.2. In flights of three or more aircraft, use all available aircraft systems (i.e. radar, IFDL, TACAN, AAI, etc.) to ensure that trail is maintained on the correct aircraft.

4.3.4. Trail Departures.

4.3.4.1. Use 20 seconds takeoff spacing.

4.3.4.2. Each aircraft will accelerate in MIL/AB power until reaching 350 KCAS. Climb at 350 KCAS until reaching .88 mach, unless otherwise briefed.

4.3.4.3. Upon reaching 350 KCAS, the flight leader will set and maintain 90% RPM unless otherwise briefed.

4.3.4.4. Limit all turns to a maximum of 30 degrees of bank.

4.3.5. **Enroute Trail.** Flight leads must brief airspeeds, power settings, and configuration.

4.3.6. **Trail Recovery.**

4.3.6.1. Trail recovery procedures must be coordinated and approved through the responsible ATC facilities and addressed in a local operating procedure or in the unit supplement to this volume. Trail recoveries will only be accomplished at home stations, local divers and deployed locations where procedures have been established and briefed. As a minimum, procedures must address each recovery profile, missed approach, climbout, lost contact, lost communications and desired/maximum spacing requirements.

4.3.6.2. Limit trail recoveries to a maximum of four aircraft.

4.3.6.3. Trail recoveries are authorized when weather at the base of intended landing is at or above the highest pilot weather category in the flight or approach minimums, whichever is higher.

4.3.6.4. Trail recoveries will not terminate in simultaneous PAR or ASR approaches. Recoveries to separate PAR/ASRs are authorized, however, flights must split prior to PAR/ASR final.

4.3.6.5. The flight lead must brief the flight on spacing, configuration, and airspeeds. Minimum spacing between aircraft is 9,000 feet in IMC and will be maintained using sensors or IFDL.

4.3.6.6. The flight lead must coordinate the trail recovery with ATC prior to taking spacing.

4.3.6.7. The formation must squawk as directed by ATC. Regardless of flight position, the lead aircraft in the trail recovery will squawk the ATC issued Mode 3 code.

4.3.6.8. ATC instructions to the lead aircraft will be for the entire flight. ATC will provide radar flight following for the entire formation.

4.3.6.9. Limit all turns to a maximum of 30 degrees of bank.

4.3.6.10. Once established on a segment of a published approach, each aircraft must comply with all published altitudes and restrictions while maintaining trail separation.

4.3.6.11. Unless local procedures establish defined reference points for airspeed/configuration changes, the flight lead will direct changes by radio. At flight lead's call, all aircraft must simultaneously comply with the directed change.

4.3.6.12. All aircraft will report the final approach fix.

4.3.6.13. If contact is lost with the preceding aircraft, the pilot will transmit "C/S lost contact." The preceding aircraft will respond with altitude, airspeed and heading. Establish altitude deconfliction and coordinate a separate clearance with ATC. If contact is lost while established on a segment of a published approach, flight members may continue the approach, but must confirm separation via navigation aids. If separation cannot be confirmed, execute missed approach or climbout as instructed by ATC.

4.4. Formation Break-up. Formation break-up from a visual formation will occur in VMC. If IMC is unavoidable, breakup from a visual formation will occur in straight and level flight. This restriction does not apply to trail formation. Prior to an IMC break-up, the flight leader must transmit attitude, airspeed, altitude, and altimeter setting which will be acknowledged by wingmen. Flight leaders will confirm (and wingmen will acknowledge) that all flight members have the ability to navigate independently (operable CNIs and GINS, and/or reception of appropriate TACAN/ILS).

4.4.1. Prior to split-up, the flight lead must ensure that all wingmen have systems available to provide sufficient navigation to landing (GINS, CNI, TACAN/ILS as required).

4.5. Formation Penetration.

4.5.1. Restrict formation penetrations in route/close formation to two aircraft when the weather at the base of intended landing is less than overhead traffic pattern minimums.

4.5.2. Formation penetrations using sensor trail procedures are authorized when weather at the base of intended landing is at/above the highest pilot weather category in the flight or approach minimums, whichever is higher.

4.6. Formation Approach. During IMC formation flights, do not change lead or wing positions below 1,500 feet AGL unless on RADAR downwind.

4.7. Simulated Instrument Flight.

4.7.1. **Restrictions.** Follow the simulated instrument flight restrictions defined in AFI 11-202V3.

Chapter 5

AIR-TO-AIR WEAPONS EMPLOYMENT

5.1. References. AFI 11-214 contains air-to-air procedures, to include operations with live ordnance applicable to all aircraft. This chapter specifies procedures or restrictions applicable to F-22A operations.

5.2. Simulated Gun Employment. Missions may be flown with a loaded gun provided the gun is safe IAW T.O. 1F-22AC-34-1CL-1 and a trigger check is first performed with the master arm switch in arm with Embedded Training deselected. Point the aircraft away from other aircraft and inhabited areas during the trigger check. Do not perform a trigger check with a hot gun. If an aircraft is flown with a hot gun or live missiles, the procedures in AFI 11-214 apply.

5.3. Maneuvering Limitations.

5.3.1. Negative-G gun jinks are prohibited.

5.4. Aerial Gunnery Tow Procedures. AFI 11-214 applies. In addition:

5.4.1. **TDU-32 A/B Banner Deployment.** Enroute to the range, chase aircraft will ensure a stable flying Banner. While in straight and level flight, the chase pilot will pass the direction of "Banner lean" (if any) in clock position to the tow pilot. This will establish the best turn direction for employment. (If Banner is flying at the 10 o'clock position; tow will turn right).

5.4.2. Abnormal Procedures.

5.4.2.1. **Unable to Release Banner.** If possible, the tow will gain chase aircraft (shooter desired) and proceed to local jettison area and attempt jettison. If Banner still remains, recover IAW local procedure.

5.4.2.2. **Banner Shot Off, Cable Remaining.** Release cable in working area. Shooter rejoins with tow to ensure no cable remains. If cable remains, recover IAW local procedures.

Chapter 6

AIR-TO-SURFACE WEAPONS EMPLOYMENT

6.1. References. AFI 11-214 contains air-to-surface procedures applicable to all aircraft. This chapter specifies procedures or restrictions applicable to F-22A operations. Qualification and scoring criteria are contained in AFI 11-2F-22AV1.

6.2. Simulated Off-Range Weapons Employment While Carrying A/G Ordnance. Off-range is defined as an area or range in which A/G ordnance release is either not authorized or in which unintentional or inadvertent release could result in ordnance impacting an area not authorized for that ordnance. AFI 11-214 and the following apply:

6.2.1. Pilots will NOT press the pickle button with inert A/G Ordnance loaded unless the following conditions are met:

6.2.1.1. Embedded Training (ET) Mode On.

6.2.1.2. Air-to-Air Master Mode selected.

6.2.1.3. INHIBIT selected on SMD

6.2.1.4. No NTB or OTB designated (nothing in Bomb List)

6.2.2. Do not conduct off-range simulated weapons employment with hung ordnance.

6.2.3. Do not conduct any off-range simulated weapons employment (A/A or A/G) with live ordnance (except 20mm IAW AFI 11-214) aboard the aircraft.

6.2.4. With live ordnance loaded (other than 20mm with a safed gun), the Master Arm switch will stay SAFE unless the pilot is in appropriate airspace and preparing to employ live ordnance.

6.3. Weather Minimums. Basic weather minimums established in AFI 11-214 apply.

6.4. Night Weapons Delivery/Range Operations. All procedures in AFI 11-214 apply.

6.5. Target Identification. Pilots will positively identify the target prior to weapons release. Pilots will reference the JDAM Mission Data Edit page to confirm the proper coordinates, elevation, and weapons data is loaded in the steerpoint for their assigned target(s) and that these values match the desired point of impact for A/G weapons. Pilots will ensure they completely understand how coordinates and elevation for their target(s) were generated and that use of this data is in compliance with all range procedures or Rules of Engagement.

6.6. Live Ordnance Procedures. When carrying live air-to-ground munitions:

6.6.1. Refer to AFI 11-214.

6.6.2. Do not make simulated weapons delivery passes on manned targets with live air-to-ground munitions loaded on the aircraft.

6.6.3. When Ground Controllers are on Class B/C ranges the following procedures apply:

6.6.3.1. All pilots will be familiar with applicable range weapons delivery procedures, appropriate targets and weapons footprints.

6.6.3.2. Ground personnel locations will be briefed and acknowledged by all pilots.

6.6.3.3. Pilots will not expend ordnance if any doubt exists as to the ground personnel or intended target locations.

Chapter 7

ABNORMAL OPERATING PROCEDURES

7.1. General. These procedures do not supersede flight manual guidance.

7.1.1. Do not accept an aircraft for flight with a safety of flight malfunction addressed in the emergency/abnormal procedure section of the flight manual until it has been corrected.

7.1.2. Do not use a malfunctioning system unless it is required for safe recovery of the aircraft. Do not continue in-flight troubleshooting a malfunction after completing flight manual emergency procedures and the aircraft may be safely recovered.

7.1.3. Do not taxi the aircraft with nosewheel steering or brake malfunctions unless authorized by T.O. 1F-22A-1.

7.1.4. For actual or perceived flight control malfunctions, terminate maneuvering and take appropriate action.

7.2. Ground Aborts.

7.2.1. If a flight member aborts prior to takeoff, the flight leader will normally renumber the flight. Flight leaders must advise the appropriate agencies of such changes.

7.2.2. In the event of an abort, formation flight may only continue if it is led by a qualified flight lead. The alternatives are a sympathetic abort or proceeding on a pre-briefed single-ship mission.

7.2.3. Delayed aircraft may join the flight at a briefed rendezvous point or may fly a briefed alternate single ship mission. If accomplishing a join-up, cease tactical maneuvering until the delayed aircraft is joined and all flight members are ready to continue.

7.3. Takeoff Aborts.

7.3.1. If an abort occurs during takeoff roll, notify tower and flight members with call sign and intentions when practical. Following aircraft will alter takeoff roll to ensure clearance or abort takeoff if adequate clearance cannot be maintained. The phrase "Cable, Cable, Cable" will be used to indicate a departure-end cable arrestment. The phrase "Barrier, Barrier, Barrier" will be used to indicate a departure-end net arrestment. Local procedures will address net barrier raising procedures.

7.3.2. When applying the brakes above 120 KCAS during a takeoff abort, or hot brakes are suspected; declare a ground emergency, taxi the aircraft to the designated hot brake area, and follow hot brake procedures.

7.3.3. If aborting a takeoff at or above 100 KCAS, lower the tailhook. If aborting below 100 KCAS, lower the tailhook if there is any doubt about the ability to stop on the runway.

7.4. Air Aborts.

7.4.1. If an abort occurs after takeoff, all aircraft will maintain their original numerical callsign.

7.4.2. Escort aborting aircraft with an emergency to the field of intended landing. In other cases, the flight leader will determine if an escort is required.

7.4.3. Abort the mission and land out of a straight-in approach, regardless of apparent damage or subsequent normal operation, for any of the following:

7.4.3.1. Birdstrike/Foreign Object Damage.

7.4.3.2. Flight control system anomalies. This does not include flight control system ICAWS that reset IAW flight manual procedures.

7.4.3.3. Single engine.

7.4.4. If an aircraft experiences an over-G, use the following procedures:

7.4.4.1. Perform a battle damage check after all over-Gs.

7.4.4.2. Terminate the mission and land as soon as practical from a straight-in approach.

7.4.4.3. Document over-Gs in IMIS after flight.

7.5. Engine Malfunctions. Report all engine anomalies during maintenance debriefing.

7.6. Radio Failure.

7.6.1. **General.** Individual aircraft experiencing radio failure will comply with procedures outlined in FLIP, AFI 11-202 Volume 3, this instruction, and local directives.

7.6.2. **Formation:**

7.6.2.1. Flight members who experience total radio failure while in close or route formation will maneuver within close/route parameters to attract the attention of another flight member and give the appropriate visual signals. Terminate the mission as soon as practical and lead the NORDO aircraft to the base of intended landing or a divert base (if required). Perform a formation approach to a drop-off on final unless safety considerations dictate otherwise.

7.6.2.2. If flying other than close/route formation when radio failure occurs, the NORDO aircraft should attempt to rejoin to a route position at approximately 500 feet on another flight member. The NORDO aircraft is responsible for maintaining clearances from other flight members until his presence is acknowledged by a wingrock, signifying clearance to join. Once joined, the NORDO aircraft will give the appropriate visual signals. If pre-briefed, the NORDO aircraft may proceed to a rendezvous point and hold. If no one has rejoined prior to reaching JOKER fuel, the NORDO aircraft should proceed to the base of intended landing or a divert base. Aircraft experiencing any difficulty/emergency in addition to NORDO will proceed as required by the situation.

7.6.3. **Aerial Gunnery/Missile Firing NORDO Procedures:**

7.6.3.1. Aircraft will not fire without two-way radio contact.

7.6.3.2. Shooting aircraft: safe the armament switches, join on another member of the flight or the tow aircraft, IAW para 7.6.2.

7.6.3.3. Aerial gunnery Lear tow aircraft: rocks wings and continue the turn if an attack is in progress. The flight leader of the attacking aircraft will "knock off" the attack and join on the tow's wing, remaining clear of the target in the event it is cut. The tow pilot will use standard hand signals to indicate his difficulty. The flight leader will signal when the target is cleared for cut with a slicing motion across the throat. After the target

is away and the flight lead determines there is no remaining cable, the tow will RTB with an escort following the briefed NORDO recovery procedures. If cable remains, follow local procedures.

7.6.4. **NORDO Recovery:**

7.6.4.1. Apply the procedures in AFI 11-205 and FLIP.

7.6.4.2. If a formation straight-in approach is flown and a go-around becomes necessary, the chase will go-around, pass the NORDO aircraft and rock his wings. The NORDO aircraft will go-around, if the situation allows. If the NORDO aircraft is in formation as a wingman, the leader will initiate a gentle turn into the wingman and begin the go-around.

7.6.4.3. A NORDO aircraft intending to make an approach-end cable engagement will signal the escorting aircraft by extending the tailhook. If the NORDO aircraft is not escorted, the pilot will fly a straight-in approach flashing the landing light on final to signal the tower.

7.7. Severe Weather Penetration. Avoid flight through severe weather. If unavoidable, flights should break-up and obtain separate clearances prior to severe weather penetration. Set airspeed to TO 1-F-22A-1 thunderstorm penetration airspeed for flight through rain showers or thunderstorms.

7.8. Lost Wingman Procedures. In any lost wingman situation, immediate separation of aircraft is essential. Upon losing sight of the leader or if unable to maintain formation, the wingman will simultaneously:

7.8.1. Execute the applicable lost wingman procedures. Refer to para 7.9 for specific spatial disorientation (SD) considerations. Smooth application of control inputs is imperative to minimize the effects of SD.

7.8.1.1. Transition to primary flight instruments.

7.8.1.2. Inform lead by transmitting "C/S is lost wingman."

7.8.1.3. After executing a lost wingman procedure, do not attempt rejoining with the flight until obtaining permission from the flight lead.

7.8.1.4. When able, obtain a separate clearance.

7.8.1.5. Observe all published terrain clearance limits.

7.8.2. **Two- or Three-Ship Flights (three-ship echelon, refer to four-ship procedures):**

7.8.2.1. **Wings-level flight (climbing, descending, or straight and level).** Turn away using 15 degrees of bank for 15 seconds, then resume original heading.

7.8.2.2. **Turns:**

7.8.2.2.1. **Outside the Turn.** Reverse the direction of turn using 15 degrees of bank for 15 seconds. Continue straight ahead to ensure separation prior to resuming the turn.

7.8.2.2.2. **Inside the Turn.** Momentarily reduce power to ensure nose-tail separation and direct the flight leader to roll out of the turn. Maintain the original turn. The leader may only resume the turn when separation is ensured.

7.8.2.3. **Final Approach.** Momentarily turn away from lead to ensure clearance and execute the published missed approach procedure.

7.8.2.4. **Missed Approach.** Momentarily turn away from lead to ensure clearance and continue the published or assigned missed approach procedure. Climb to 500 feet above missed approach altitude.

7.8.3. **Four-Ship Flights.** Number 2 and 3 follow the procedures outlined above. Number 4's initial action assumes that number 3 has also gone lost wingman. In addition to paragraph 7.8, number 4 will:

7.8.3.1. **Wings-Level Flight (climbing, descending, or straight and level).** Turn away using 30 degrees of bank for 30 seconds, then resume the original heading.

7.8.3.2. **Turns:**

7.8.3.2.1. **Outside the Turn.** Reverse direction of turn using 30 degrees of bank for 30 seconds to ensure separation from lead and number 3.

7.8.3.2.2. **Inside the Turn.** Momentarily reduce power to ensure nose-tail separation and increase bank angle by 15 degrees. Direct the leader to roll out. The leader will only resume the turn when separation is ensured.

7.8.4. Leader must acknowledge the lost wingman's radio call and, when appropriate, transmit attitude, heading, altitude, airspeed, and other parameters.

7.8.5. If a wingman becomes separated and any aircraft experiences radio failure, the aircraft with the operational radio will obtain a separate clearance. The NORDO aircraft will turn the IFF Mode 3C to 7600 while proceeding with previous clearance. If an emergency situation arises along with radio failure, set the IFF to EMERGENCY for the remainder of the flight.

7.8.6. Only practice lost wingman procedures in VMC.

7.9. Spatial Disorientation (SD). Conditions that prevent a clear visual horizon or increase pilot tasking are conducive to SD. To prevent SD, the pilot must increase his instrument crosscheck rate. If SD symptoms are encountered:

7.9.1. **Single Ship:**

7.9.1.1. Concentrate on flying basic instruments with frequent reference to the HUD. The SFG may be used as an alternate attitude reference if it is using a different GINS source than the HUD (i.e. HUD on GINS 1 and SFG on Right UFD).

7.9.1.2. If symptoms persist and conditions permit, fly straight and level flight until symptoms abate, usually within 60 seconds. Consider using the autopilot.

7.9.1.3. If necessary, declare an emergency and advise ATC.

7.9.1.4. NOTE: It is possible for SD to proceed to the point where the aircrew is incapacitated and unable to see or interpret the flight instruments. In this situation, aircraft control may be impossible. If this occurs, the aircrew should consider ejecting.

7.9.2. **Formation Lead:**

7.9.2.1. Advise the wingmen that flight lead has SD and comply with procedures in paragraph 7.9.1.

7.9.2.2. Use the wingmen to confirm attitude and provide verbal feedback.

7.9.2.3. If symptoms persist, terminate the mission and recover the flight by the simplest and safest means possible.

7.9.3. Formation Wingman:

7.9.3.1. Advise lead of the disorientation.

7.9.3.2. Lead will advise wingman of aircraft attitude, altitude, heading, and airspeed.

7.9.3.3. If symptoms persist and conditions permit, lead will establish straight and level flight for 30-60 seconds.

7.9.3.4. If the above procedures are not effective, lead should consider passing the lead to the wingman, provided the leader will be able to maintain situational awareness from a chase position. Transfer lead while in straight and level flight. Once assuming the lead, maintain straight and level flight for 60 seconds. If necessary, terminate the tactical mission and recover by the simplest and safest means possible.

7.9.4. Greater than 2-Ship Formation. Lead should separate the flight into elements to more effectively handle a wingman with persistent SD symptoms. Establish straight and level flight IAW paragraph 4.4 (Formation Break-up). Plan to keep the element with the SD pilot straight and level while the other element separates.

7.10. Armament System Malfunctions.

7.10.1. Inadvertent Release. Release due to a malfunction of the armament system.

7.10.1.1. Record switch positions at the time of inadvertent release and provide to armament and safety personnel. Record the impact point, if known.

7.10.1.2. Safe the armament switches and do not attempt further release. Treat remaining stores as hung ordnance and follow hung ordnance procedures during RTB.

7.10.1.3. If remaining stores present a recovery hazard, jettison them in a suitable area on a single pass, if practical.

7.10.2. Failure to Release/Hung Ordnance. If ordnance fails to release when all appropriate switches are set, proceed as follows.

7.10.2.1. Attempt to release store(s) IAW T.O. 1F-22AC-34-1CL-1. If unsuccessful, and there is NOT an unsafe condition, then follow hung ordnance recovery procedures.

7.10.2.2. If an unsafe condition exists (attached by 1 lug, etc.), attempt to jettison store(s) using selective jettison procedures

7.10.3. Hangfire/Misfire:

7.10.3.1. A missile that fires but fails to depart the aircraft is a hangfire. If this occurs, the missile should be closely observed and safety checked by a chase pilot.

7.10.3.2. A missile that fails to fire when all appropriate switches were selected is a misfire. If this occurs, safe the Master Arm switch and follow the hung ordnance recovery procedures.

7.10.4. Hung Ordnance/Weapons Malfunction Recovery:

7.10.4.1. If practical, visually inspect the area for damage to aircraft, WBDs, or ordnance.

7.10.4.2. Declare an emergency for hung live ordnance (not required for hung practice/inert ordnance or when no attempt was made to expend live ordnance).

7.10.4.3. If available, obtain a chase aircraft (N/A at night unless NVG-Capable chase is available) and avoid populated areas and close trail formations.

7.10.4.4. Close weapons bay doors prior to landing IAW T.O. 1F-22AC-34-1CL-1

7.10.4.5. Land from a straight-in approach.

7.10.5. Miscellaneous Procedures:

7.10.5.1. Pilots will not attempt to expend ordnance using a delivery system with a known weapons release malfunction.

7.10.5.2. When abnormal missile launch or erratic missile flight is noted after launch, visually inspect the launching aircraft by another pilot (if possible) to determine if any damage has occurred.

7.11. Post Arresting Gear Engagement Procedures.

7.11.1. Do not shut down the engine(s) unless directed by the ground crew, there is a fire, or other conditions dictate.

7.11.2. Raise the tailhook on the ground crew's signal.

7.11.3. Do not taxi until directed.

7.11.4. Comply with local directives.

7.12. In-flight Practice of Emergency Procedures.

7.12.1. Simulated Emergency Procedure is defined as any procedure that produces an effect that closely parallels an actual emergency, such as retarding the throttle to simulate the drag equivalent to a flamed out engine.

7.12.2. **Aborted Takeoff Practice.** Only practice aborted takeoffs in a simulator (Full Mission Trainer (FMT), Weapons and Tactics Trainer (WTT), Cockpit Procedures Trainer (CPT), or Distributed Mission Operations Simulator (DMO).

7.12.3. Simulated in-flight loss of both engines is prohibited.

7.12.4. Practice in-flight engine shutdown is prohibited.

7.12.5. Emergency Landing Patterns (Refer to AFI 11-202 Volume 3).

7.12.5.1. **Field Requirements.** Practice of emergency landing patterns at active airfields is authorized provided that crash rescue and air traffic control facilities are available and in operation.

7.12.5.2. **Supervisory Requirements.** IQT (including FTU) pilots require an IP in a chase aircraft. MQT (including FTU) pilots require a SOF in place and an IP or flight lead monitoring from the traffic pattern.

7.12.5.3. **Pattern Procedures:**

7.12.5.3.1. Include the type of practice emergency pattern in the gear check call.

7.12.5.3.2. Initiate practice single-engine go-arounds in sufficient time to ensure the aircraft does not descend below 300 feet AGL. Simulated single-engine approaches may descend below 300 feet AGL provided the approach terminates in a full stop landing or the go-around from a low approach or touch and go landing is performed with both engines. When conducting such training, the pilot will advise the appropriate air traffic controller of his intentions.

7.12.5.3.3. Simulated single-engine patterns may be practiced while flying. HUD-off, SRB and Standby Flight Group approaches will only be practiced in the FMT, WTT, or CPT.

7.13. Search and Rescue (SARCAP) Procedures. If an aircraft crashes, immediately attempt to locate possible survivors and initiate rescue efforts. Expect that the survivors may initially suffer from shock or have delayed reactions due to ejection injuries. The following procedures are by no means complete and should be adjusted to meet each unique search and rescue situation.

7.13.1. Knock off maneuvering.

7.13.2. Establish a SARCAP commander.

7.13.3. Squawk 7700 to alert ATC/GCI of the emergency situation.

7.13.4. Communicate the emergency situation and aircraft/flight intentions immediately to applicable control agencies. Use GUARD frequency if necessary.

7.13.5. Mark the last known position of survivors/crash site using any means available (Markpoint, TACAN, INS, ATC/GCI position and/or visual references).

7.13.6. Remain above the highest ejection altitude, if known, or the highest observed parachute until determining the position of all possible survivors.

7.13.7. Deconflict other aircraft assisting in the SARCAP by altitude to preclude midair collision. Establish high/low CAPs as necessary to facilitate communications.

7.13.8. Revise BINGO fuels or recovery bases as required to maintain maximum SARCAP coverage. Do not overfly the adjusted BINGO fuel.

7.13.9. Relinquish SARCAP operation to designated rescue forces upon their arrival.

7.13.10. Follow local or briefed procedures.

Chapter 8

LOCAL OPERATING PROCEDURES

8.1. General. This chapter provides a consolidated framework for wings to supplement (IAW 33-360) local operating procedures. Units composed of multiple aircraft types may publish guidance in a single, stand-alone local operating instruction instead of supplementing this AFI. Added or stand-alone procedures will not be less restrictive than those contained elsewhere in this volume. This chapter is not intended to be a single source document for procedures contained in other directives or regulations. Avoid unnecessary repetition of guidance provided in other established directives; however, reference to those directives is acceptable when it serves to facilitate the location of information. This chapter is authorized to be issued to each pilot. Units may supplement the following paragraphs for local operating guidance:

- 8.1.1. **Section A. Introduction.**
- 8.1.2. **Section B. General Policy.**
- 8.1.3. **Section C. Ground Operations.**
- 8.1.4. **Section D. Flying Operations.**
- 8.1.5. **Section E. Weapons Employment.**
- 8.1.6. **Section F. Abnormal Procedures.**
- 8.1.7. **Attachments (Illustrations).**

8.2. If Applicable Procedures. If applicable, include procedures for the following in the appropriate section above:

- 8.2.1. **Command and Control.**
- 8.2.2. Fuel Requirements and Bingo Fuels.
- 8.2.3. Diversion Instructions.
- 8.2.4. Jettison Areas, Procedures and Parameters (IFR/VFR).
- 8.2.5. Controlled Bailout Areas.
- 8.2.6. Local Weather Procedures.
- 8.2.7. Unit Standards.
- 8.2.8. Approved Alternate Missions.
- 8.2.9. Cross-Country Procedures.
- 8.2.10. **Search and Rescue and On-Scene Commander Procedures.**
- 8.2.11. Bird/Wildlife Aircraft Strike Hazard (BASH) program guidance IAW AFI 91-202, *The US Air Force Mishap Prevention Program* and AFPAM 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*.
- 8.2.12. Environmental Restrictions to Flight Operations (winds, sea state, temperature, etc.) applicable to unit operating locations.

8.3. Distribution of Local Supplements. When published, units will forward copies of the local supplement to MAJCOM and appropriate subordinate agencies, who will review and return comments back to the unit(s). Distribution of local supplements may begin before the review process is complete unless otherwise specified by MAJCOM or appropriate subordinate agency. If a procedure is deemed applicable to all F-22 units, it will be incorporated into the basic AFI volume.

8.4. Forms Adopted. AF Form 847, *Recommendation for Change of Publication*. AFTO Form 781, *ARMS Aircrew/Mission Flight Data Document*. AFTO FORM 781 A, *Maintenance Discrepancy and Work Document*.

PHILIP M. BREEDLOVE, Lt Gen, USAF
DCS, Operations, Plans and Requirements

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 11-2F-22A, Volume 1, *F-22A Aircrew Training*, 19 May 2006

AFI 11-202, Volume 3, *General Flight Rules*, 5 April 2006

AFI 11-205, *Aircraft Cockpit and Formation Flight Signals*, 19 May 1994

AFI 11-209, *Air Force Aerial Events*, 4 May 2006

AFI 11-214, *Air Operations Rules and Procedures*, 22 Dec 2005

AFI 11-218, *Aircraft Operations and Movement on the Ground*, 11 May 2005

AFI 11-246, Volume 1, *Air Force Aircraft Demonstrations (A-10, F-15, F-16, F-22)*, 29 September 2008

AFI 11-301 Volume 1, *Aircrew Flight Equipment (AFE) Program*, 25 Feb 2009

AFI 11-404, *Centrifuge Training for High-G Aircrew*, 28 Oct 2005

AFI 33-360 *Publications and Forms Management*, 18 May 2006

AFMAN 11-217 Volume 1, *Instrument Flight Procedures*, 3 Jan 2005

AFMAN 11-217 Volume 3, *Supplemental Flight Information*, 23 Feb 2009

AFMAN 33-363, *Management of Records*, 1 March 2008

AFPAM 11-216, *Air Navigation*, 1 Mar 2001

AFPAM 11-419. *G-Awareness for Aircrew*, 1 Dec 1999

AFPD 11-2, *Aircraft Rules and Procedures*, 14 Jan 2005

AFPD 11-4, *Aviation Service*, 1 Sep 2004

AFTTP 3-1 Volume 1, *General Planning and Employment Considerations*, 15 Sep 2008

AFTTP 3-1 Volume 12, *Tactical Employment—F-22A*, 9 Feb 2009

AFTTP 3-3 Volume 12, *Combat Aircraft Fundamentals—F-22A*, 14 Nov 2008

FLIP, *Flight Information Publication*

T.O. 1F-22AA-1/1F-22AA-1-1, *Flight Manual—F-22A*, 24 Jun 2009

T.O. 1F-22AC-34-1-1, *Avionics and Non-Nuclear Weapons Delivery Manual—F-22A*, 20 May 2009

Air Force Records Disposition Schedule (RDS)

Abbreviations and Acronyms

AAI—Air-to-Air Interrogator

AB—After Burner

ACBT—Air Combat Training
ACC—Air Combat Command
ACMI—Air Combat Maneuvering Instrumentation
AFE—Aircrew Flight Equipment
AGL—Above Ground Level
AHC—Aircraft Handling Characteristics
ALC—Air Logistics Center
AOA—Angle of Attack
ASR—Airport Surveillance Radar
ATC—Air Traffic Control
AWACS—Airborne Warning and Control System
BMC—Basic Mission Capable
CATMs—Captive Training Missiles
CAP—Combat Air Patrol
CG—Center of Gravity
CHUM—Chart Update Manual
CMR—Combat Mission Ready
CPT—Cockpit Procedures Trainer
C/S—Call Sign
DEAD—Destruction of Enemy Air Defenses
DH—Decision Height
DMVR—Digital Mass Memory Video Recorder
ECM—Electronic Countermeasures
EOR—End of Runway
FAF—Final Approach Fix
FE—Flight Examiner
FLIP—Flight Information Publications
FTU—Formal Training Unit
FW—Fighter Wing
G—Gravitational Load Factor
GCI—Ground Controlled Intercept
GPS—Global Positioning/Inertial Reference System

HUD—Heads Up Display
IAW—In Accordance With
ICAWS—Integrated Caution, Advisory, and Warning System
IFE—In-Flight Emergency
IFDL—Intra-Flight Data Link
IFF—Identification Friend or Foe
IFR—Instrument Flight Rules
IMC—Instrument Meteorological Conditions
IMIS—Integrated Maintenance Information System
IP—Instructor Pilot
IQT—Initial Qualification Training
KCAS—Knots Calibrated Airspeed
KTAS—Knots True Airspeed
KM—Kilometers
LOWAT—Low Altitude Training
MAJCOM—Major Command
MDA—Minimum Descent Altitude
MIT—Mass Item
MOA—Military Operating Area
MQT—Mission Qualification Training
MSA—Minimum Safe Altitude
MSL—Mean Sea Level
N/A—Not Applicable
NAF—Numbered Air Force
NLT—Not Later Than
NM—Nautical Miles
NORDO—No Radio
NTS—Next-to-Shoot
NVG—Night Vision Goggles
OPR—Office of Primary Responsibility
OT&E—Operational Test and Evaluation
PACAF—Pacific Air Forces

PAR—Precision Approach Radar
RAA—Route Abort Altitude
RCR—Runway Condition Report
RNAV—Area Navigation
RTB—Return to Base
RWR—Radar Warning Receiver
SARCAP—Search and Rescue Combat Air Patrol
SES—Stored Energy System
SETOS—Single Engine Takeoff Speed
SFG—Standby Flight Group
SIF—Selective Identification Feature
TACAN—Tactical Air Navigation
TERPS—Terminal Instrument Procedures
TOLD—Takeoff and Landing Data
T.O.—Technical Order
TOT—Time On Target
USAF—United States Air Force
USAFE—United States Air Forces in Europe
UFD—Upfront Display
VASI—Visual Approach Slope Indicator
VFR—Visual Flight Rules
VMC—Visual Meteorological Conditions
VR—VFR Route
WSEP—Weapon Systems Evaluation Program

Attachment 2

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, NUCLEAR, AND HIGH YIELD EXPLOSIVE (CBRNE) OPERATIONS

A2.1. General Information. Potential adversary use of CBRNE weapons against a friendly airfield presents a serious threat to flying operations. Although the most effective way for aircrews to avoid this threat is to be airborne before those weapons are detonated/dispersed and then land at a field that has not been contaminated, all personnel must be prepared to operate from a field that has come under CBRNE attack.

A2.2. Mission Preparation. Be aware of the status of the CBRNE environment at the planned launch and recovery airfields, potential divert bases, and throughout the area in which the sortie may fly. Know the current and forecast surface wind direction and the MOPP level in effect for relevant sectors of the airfield. Don appropriate aircrew chemical defense equipment (ACDE) or Ground Crew Ensemble (GCE) to match the appropriate MOPP level (reference AFMAN 10-100) and carry individual protective equipment (IPE) as required.

A2.3. Stepping to Fly and Aircraft Preflight. This may entail donning ACDE or transitioning from GCE to ACDE. Take precautions to protect aircrew from injury and or contamination while in transit from the squadron facility to the aircraft. If possible, transport aircrew in a vehicle that provides overhead cover (enclosed vehicle). If aircrew travel on foot is unavoidable, choose a route that takes maximum advantage of available overhead cover (sun shades, buildings, etc.) to avoid agents that may be settling from the air. If extra aircrew members are available for preflight duties, consider assigning them to do so wearing GCE. This will allow the aircrew actually flying to minimize exposure.

A2.3.1. Alarm Red (or Theater Equivalent) Prior to Engine Start. If Alarm Red occurs during the step or preflight process, take cover and don appropriate MOPP. This may require use of the ground crew mask. A hardened aircraft shelter (HAS) provides optimum protection, if available. Use caution if entering a HAS that contains aircraft and/or equipment. Close doors after entry. If a HAS or other overhead cover is not immediately available, accept the best rapidly reachable cover.

A2.4. Engine Start to Takeoff. If a HAS is available, use it to minimize exposure time by accomplishing aircraft arming and End of Runway (EOR) procedures inside it (if local procedures permit) and by delaying taxi time as long as possible prior to takeoff.

A2.4.1. Aircraft Launch to Survive (LTS). Units will develop local procedures to provide this option to the commander. In general, aircraft may LTS any time after engine start if they have sufficient fuel and safe, expeditious access to a runway. This option may only be practical for aircraft that are near EOR prior to takeoff or that have just landed.

A2.4.2. Alarm Red Prior to Taxi. If in a HAS, the normal procedure is to shut down. Engine noise may preclude effectiveness of normal alert notification procedures, so ensure ground personnel are aware of the alarm warning, assume proper MOPP, and close HAS doors. Use hand signals if necessary.

A2.4.3. Alarm Red (or Theater Equivalent) After Taxi. Units typically establish procedures for this contingency depending on whether additional protection is available along the taxi route (empty HAS, for instance). Ideally, ground crew sheltering in such a

HAS would be available to assist in normal engine shutdown procedures and to close HAS doors. If protection is not available, the best option may be LTS. Maintain contact with Command and Control (C2) entities (Wing Operations Center, Maintenance Operations Center, Supervisor of Flying, etc.) to ensure unity of effort in the overall plan.

A2.5. Takeoff to Landing.

A2.5.1. Contamination. If Chemical Warfare (CW) agent contamination occurred prior to takeoff, flying the aircraft will dissipate the agent to some degree. The total amount of dissipation will be greater with lower flight altitudes and longer flight times. Because the agent may have entered wheel wells, flaps, etc., consider flying in landing configuration to increase airflow to these areas. In any circumstances, merely flying the aircraft is unlikely to achieve complete decontamination.

A2.5.2. Preparing to Land. Aircrew should remain aware of the status of primary and alternate landing locations. Do not attempt to land during Alarm Red situations unless there is no other option. Follow C2 directions and either hold or divert. If mission needs preclude divert, hold until the Alarm Red (or theater equivalent) has cleared or become an Alarm Black. Prior to landing, gain awareness of contaminated sectors of the airfield and of current/forecast surface winds. Use this information in conjunction with C2 direction to plan a route from landing to engine shutdown. The liquid deposition phase following a CW airburst attack can extend up to 1 hour. If landing during Alarm Black, expect a contaminated environment and MOPP 4.

A2.6. Landing to Engine Shutdown. Take advantage of any protection available, minimizing taxi time and distance. Maintain contact with C2 in order to remain aware of unexploded ordnance and/or damage to airfield movement surfaces. If a HAS is available and local procedures permit, accomplish aircraft de-arm and EOR procedures there. If Alarm Red (or Theater Equivalent) occurs between landing and engine shutdown, considerations are similar to those discussed in the engine-start-to-takeoff section.

A2.7. After Engine Shutdown. Don appropriate MOPP if not already worn. If circumstances permit, accomplish normal post-flight inspection procedures. If the aircraft is not contaminated, close the canopy. If there is any suspicion of personnel contamination, aircrew will process through an aircrew contamination control area (ACCA). Accomplish maintenance debriefings under cover to the maximum extent possible.

Attachment 3**GENERAL & SPECIAL SUBJECT BRIEFING GUIDE****MISSION DATA**

1. Time Hack
2. EP/Threat of the Day
3. Mission Objective(s)
4. Mission Overview
5. Mission Data Card
 - a. Mission Commander/Deputy Lead
 - b. Joker/Bingo Fuel
 - c. Takeoff and Landing Data
 - d. Working Area
6. Weather/Sunrise/Sunset/Moon Illumination
7. NOTAMs/Bird Strike Potential
8. Personal Equipment
9. FCIF/Pubs/Maps

GROUND PROCEDURES

1. Pre-Flight
 - a. Aircraft
 - b. Armament
2. Check-In
3. Taxi/Marshaling/Arming
4. Spare Procedures

TAKEOFF

1. Runway Lineup
2. Takeoff/Takeoff Interval
3. Abort
4. Jettison Procedures
5. Low Altitude Ejection
6. Landing Immediately After Takeoff

DEPARTURE/ENROUTE

1. Routing

2. Trail Departure
3. Join-Up/Formation
4. Systems/Ops Checks

RECOVERY

1. Rejoin
2. Battle Damage Check
3. Type Recovery
4. Flight Break-Up
5. Pattern and Landing
6. After Landing/De-Arm
7. Emergency/Alternate Airfields

SPECIAL SUBJECTS (as applicable)

1. Instructor Responsibilities
2. Chase Procedures
3. IFF Procedures
4. Radar/Visual Search Responsibilities/Midair Collision Avoidance
5. Dissimilar Formations
6. Carriage / Jettison Limitations
7. Terrain Avoidance
 - a. Departure/Enroute/Recovery
 - b. Altitude Warning Settings
8. Bird Strike Procedures/Use of Visor(s)
9. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)
10. G-Awareness
 - a. G-Suit connection/G-tolerance/G-Awareness Turn
 - b. Use of L-1 Anti-G Straining Maneuver (AGSM)
11. Visual Illusions/Perceptions
12. Spatial Disorientation/Unusual Attitudes
13. Lost Wingman
14. Radio Inoperative
15. SARCAP

16. Recall Procedures

17. SIIs

Attachment 4**ADVANCED HANDLING/INSTRUMENT BRIEFING GUIDE****AIRWORK**

1. Airspace Restrictions
2. Area Orientation
3. Instructor Responsibilities
4. Maneuvers

APPROACHES

1. Frequencies
2. Holding
3. Penetration
4. Missed Approach / Climb Out

SPECIAL SUBJECTS

1. "G" Awareness
2. Fuel Awareness/AB Use/Consumption Rates
3. Special Subjects and Maneuvering Limitations
 - a. Airspeed and "G"
 - b. Recognition/Prevention/Recovery From Out of Control
 - c. Maneuvering at Heavyweight/High Angles of Attack/Asymmetrical Configuration
 - d. Effects of CG Throughout the Flight
 - e. Time to Ground Impact
 - (1) Wings Level
 - (2) Overbank/Under G
4. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Attachment 5**AIR REFUELING BRIEFING GUIDE****GENERAL**

1. Tanker Call Sign(s)/Receiver Assignments
2. Refueling Track(s)
 - a. Altitude
 - b. Airspeed
 - c. Airspace Restrictions
3. ARIPs, ARCPs, ARCTs
4. Radio Frequencies

BUDDY PROCEDURES

1. Departure
2. Join-Up

ENROUTE

1. Route of Flight
2. Formation
3. Ops Checks

RENDEZVOUS

1. Type Rendezvous
2. Holding Procedures/Formation
3. Ground Radar Assistance
4. Tanker Identification - TACAN/Radar/AAI/Visual
5. Radar Procedures/Techniques
6. Wingman/Deputy Lead Responsibilities
7. Receiver Formation/Join-Up Procedures
8. Rendezvous Overrun

REFUELING

1. Checklist Procedures
2. Radio Calls
3. Refueling Order
4. Techniques
5. Radio Silent Procedures

- a. EMCON
- b. Visual Signals
- 6. Fuel Off-Load
- 7. Bingo Fuel (Abort Points/Abort Bases)
- 8. Drop-Off Procedures
- 9. Wake Turbulence

REFORM AND EXIT

- 1. Formation
- 2. Clearance

EMERGENCY PROCEDURES

- 1. Breakaway Procedures
- 2. Systems Malfunctions
- 3. Damaged Receptacle

IMC/NIGHT CONSIDERATIONS

- 1. Lost Wingman Procedures
- 2. Aircraft Lighting

SPECIAL SUBJECTS

- 1. Fuel Awareness/AB Use/Consumption Rates
- 2. Flight Path Deconfliction/Other Receiver Considerations
- 3. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Attachment 6**ADVERSARY COORDINATION**

1. Call Signs
2. Number and Type Aircraft
3. Scenario/AOR discussion
4. Objective(s)-Blue, C2, Intel/Space, Red
5. Weather/NOTAMS
6. Mission Overview
7. Ground Ops
 - a. Taxi/Marshall/Arming deconfliction and timing
 - b. Check-in time/Freq
 - c. Minimum numbers
 - d. How much delay available
8. Takeoff
 - a. Times
 - b. MARSA options
9. Departure
 - a. Routing
 - b. Weather Check
 - c. Late entries
10. Area
 - a. Airspace times
 - b. Restrictions
 - (1) Altitude
 - (2) Supersonic
 - (3) Chaff/Flare
 - (4) Noise Sensitive
 - c. Points / Marshall and Cap Limit Lines
 - d. Average terrain (Controlled/Uncontrolled bailout altitudes)
 - e. Ground references
 - f. Emergency airfields
11. Recovery

- a. Order / MARSA
- b. Dissimilar formations
- 12. Abnormal Procedures
 - a. EPs (Like/dissimilar aircraft)
 - (1) Cruise / Gear / Final Approach Airspeeds
 - b. NORDO
 - c. Lost Wingman
 - d. RESCAP
- 13. Special Subjects
 - a. Mid-Air Collision Avoidance
 - b. "G" Awareness
 - c. Fuel Awareness/AB Use/Consumption Rates
 - d. Flight Path Deconfliction
 - e. Channelized Attention, Task Saturation/Prioritization, and Complacency
- 14. Special Interest Items
- 15. Ladder
- 16. SPINS/Setups
 - a. Red-air replications
 - b. Regeneration criteria
- 17. Fight Administration
 - a. Desired Setup Range (if applicable)
 - b. Fight's On / Knock-it-off per engagement or Continuous Vul
 - c. Vul times (if applicable)
 - d. Timeout / Kill ROE
 - (1) RTO / Non-RTO option
 - (2) Pk Option (IAW 3-1.GP)
 - (3) Timeout, Timeout Tally and Kill Passage, acknowledgement, relays and repeats
 - (4) Kill removal procedures
 - e. Terminate (reasons and procedures)
 - f. Knock-it-off (reasons and procedures)
- 18. Training Rules
 - a. IAW AFI 11-214

- b. Highlights
 - (1) Maneuvering limits (limited / unlimited)
 - (2) Bubble
 - (3) Blocks
 - (4) LOWAT transition altitude (if applicable)
 - (5) Floor
- 19. Contingencies
 - a. Weather
 - b. GCI / AWACS / CRC control fallout
 - c. Aircraft fallout (min numbers)
 - d. Alternate missions
- 20. Debrief
 - a. Time / Location
 - b. Required information
- 21. Questions

Attachment 7**GCI/AWACS AND TACTICAL INTERCEPTS BRIEFING GUIDE**

1. Area Information
 - a. CAP Points
 - b. Target Locations
 - c. Bullseye location and cuts of critical points
 - d. Radar and Communication blind zones
 - e. Safe Areas/FEBA/Ground Threats
 - f. Friendly SAM Locations
2. Threat Type and Simulation
3. ID Criteria
4. Communications
 - a. Requirements (other than 3-1.GP/ALSA)
 - b. Type/Level of Control
 - d. Frequencies
 - e. IFF/SIF squawk and procedures
5. Training Rules
 - a. Blocks
 - b. Floor / Transition altitude

FLIGHT/ELEMENT TACTICS

1. Fill-ins
 - a. Contrail altitude
 - b. Winds aloft
 - c. Ordnance
 - d. Reload criteria for training
 - e. ID criteria and method(s)
 - f. EMCON procedures
2. Avionics Set-up
 - a. Radar Elevation
 - b. Waypoints/Route
 - c. IFF

- d. IFDL
- e. RW/EW Scan Schedules/Search Volumes
- 3. CAP
 - a. Formation/Altitude/Airspeed
 - c. Search Responsibilities
 - d. Commit
 - (1) Criteria/Range
 - (2) Procedures
- 4. Intercept Phase
 - a. Formation/Altitude/Airspeed
 - b. Detection
 - c. ID Criteria
 - d. Search Responsibilities (Radar/Visual)
 - e. Targeting Plan
 - f. Tactic
 - (1) Execution
 - (2) Formation
- 5. Engagement Phase
 - a. Shot doctrine and mechanics
 - b. Base/MAR Crossing Decisions
 - c. Recommits
 - b. Egress Formation/Responsibilities
- 6. Contingencies
 - a. Avionics Malfunction (Radar / IFDL)
 - b. RW
 - c. EXCM
 - d. IFF/SIF and Min-risk Routing
 - e. Low Fuel / Ordnance
 - d. Rendezvous point
- 7. Live Missile/Hot Gun Safety Procedures
- 8. Additional Considerations
 - a. Threat Reaction

- b. Codewords
- c. EMI/EP/EA Effects

Attachment 8**ESCORT MISSION BRIEFING GUIDE****ENROUTE TO RENDEZVOUS/POST-MISSION NAVIGATION**

1. Formation
2. Route of Flight
3. Control Agency Call Sign/Frequency

RENDEZVOUS

1. Protected Force Call Sign
2. Altitude
3. Airspeed
4. Number of Aircraft

ESCORT PROCEDURES

1. Striker Ingress
 - a. Route(S)
 - b. Formation
 - c. Altitude
 - d. Airspeed
 - e. Primary/Secondary target locations and TOTs
 - f. Tactics/EMCON
1. Type Formation
2. Tactics
3. Commit
 - a. Criteria/Range
 - b. Procedures
4. Escort Route
5. Contracts
 - a. Targeting Strikers
 - b. Lean / Spin procedures
6. Egress
 - a. Tactics
 - b. Formation
7. Contingencies
 - a. Avionics Malfunction (Radar / IFDL)
 - b. RW

- c. EXCM
 - d. IFF/SIF and Min-risk Routing
 - e. Low Fuel / Ordnance
 - f. Rendezvous point
8. Additional Considerations
- a. EMI/EP/EA Effects

Attachment 9**OFFENSIVE COUNTER-AIR SURFACE ATTACK / DEAD**

1. INGRESS
 - a. Formation
 - b. Route of Flight
 - c. Control Agency Call Sign/Frequency
2. THREAT
 - a. Type
 - b. Numbers
 - c. Threat reactions
3. Attack
 - a. Target type(s)
 - b. Weaponing (required Pd)
 - c. Weapon(s) / Fuze settings
 - d. DPI sort
 - e. Release criteria
 - f. Attack Contingency
 - (1) Degraded weapon state (INS only)
 - (2) Re-attack (formation/procedures)
4. Air-to-Air Tactics
 - a. Detection
 - b. ID Criteria
 - c. Search Responsibilities (Radar/Visual)
 - d. Targeting Plan
 - e. Tactic
 - (1) Execution
 - (2) Formation
5. Engagement
 - a. Shot doctrine and mechanics
 - b. Base/MAR Crossing Decisions
 - c. Recommits
6. Egress

- a. Tactics
 - b. Formation
 - c. Rendezvous point
7. Contingencies
- a. Avionics Malfunction (Radar / IFDL)
 - b. RW
 - c. EXCM
 - d. IFF/SIF and Min-risk Routing
 - e. Low Fuel / Ordnance

Attachment 10**AERIAL GUNNERY TOW COORDINATION BRIEFING GUIDE****TOW COORDINATION**

1. Ground/T.O./Departure
2. Rendezvous
3. Airspace Data
4. GCI Support
5. Target Launch/Chase
6. Shooter Order
7. Type Pattern
8. Tow Altitude Block(s)/Flight Parameters
9. Intercept Phase/Pattern Set-Up
10. Arming Procedures
11. Timing
12. Tow Maneuvering Parameters
13. Shooter/Firing Plan
14. Radio Procedures
15. Termination
 - a. Timing
 - b. Minimum Altitude
 - c. Joker/Bingo Fuel
 - d. Winchester
 - e. Fouls
16. Armament Safety Check
17. Scoring
18. Subsequent Set-Ups
19. Target Drop Procedures
20. Recovery Order
21. Abnormal Procedures
 - a. Erratic Target
 - (1) During Deployment
 - (2) During Employment

- b. Target Drag-Off
- c. Recovery With Target/Cable
- d. NORDO
 - (1) During Engagement
 - (2) Target Drop
 - (3) Visual Signals
 - (4) Recovery

Attachment 11**AERIAL GUNNERY BRIEFING GUIDE****GENERAL**

1. Formation
2. Area Information
 - a. Controlling Agency
 - b. Airspace Restrictions
 - c. Frequencies
3. Switch Positions
4. Arming Procedures
5. Intercept / Set-Up
6. Shooter Sequence
7. Position Changes
8. Chase Procedures
9. Timing

EMPLOYMENT

1. Firing Parameters
 - a. Minimum Range
 - b. Overtake
 - c. Angle-Off
 - d. Error Analysis
2. Contingencies
 - a. Avionics Malfunctions
 - b. Gun Malfunctions
 - c. Range Estimation Without Radar
3. Safety Considerations
 - a. Target Fixation
 - b. Debris Avoidance
 - c. Fouls

TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS**ALTERNATE MISSION**

1. Type Mission (refer to appropriate mission briefing guide)

2. Mission Objectives

SPECIAL SUBJECTS

1. Minimum Altitudes

2. "G" Awareness

3. Fuel Awareness/Ops Checks/AB Use/Consumption Rates

4. Maneuvering Limitations

a. Airspeed/"G"/Stress

b. Recognition/Prevention/Recovery From Out of Control

5. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Attachment 12**LOW-LEVEL NAVIGATION BRIEFING GUIDE****GENERAL**

1. Route/Clearance/Restrictions
2. Flight Responsibilities
 - a. Navigation
 - b. Radar/Visual Search
3. Entry/Spacing /Holding/Initial Altitude (MSA)

ROUTE PROCEDURES

1. Fence Checks
2. Tactical Formation/Turns
3. Low Level Navigation
 - a. Dead Reckoning/Use of Navigation Aids/ Equipment (i.e. GINS/SD)
 - b. Radar Procedures/Techniques
 - c. Visual Procedures/Techniques
 - d. Updates/Calibrations
 - e. Time/Fuel Control
 - f. Terrain Following/Avoidance/Wingman Considerations
 - g. Leg Altitudes/ Obstacles (MSL/AGL)
4. Threat Reactions
 - a. RW/EW/EXCM
 - b. Engagement Criteria
 - c. Flight Path Deconfliction
 - d. Termination

EMERGENCIES

1. Aircraft Malfunctions
2. Route Abort Procedures (RAA/MSA)/ATC Frequencies

TRAINING RULES/SPECIAL OPERATING INSTRUCTIONS**ALTERNATE MISSION**

1. Type mission (refer to appropriate mission briefing guide)
2. Mission Objectives

SPECIAL SUBJECTS

1. Airspace Restrictions
2. "G" Awareness/Ops Checks
3. Fuel Awareness/AB Use/Consumption Rates
4. Flight Path Deconfliction
5. Maneuvering Limitations
 - a. Airspeed and "G"
 - b. Recognition/Prevention/Recovery From Out of Control
6. Time to Ground Impact
 - a. Wings Level
 - b. Overbank/Under "G"
7. Night Considerations
8. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Attachment 13**AIR DEFENSE/ALERT BRIEFING GUIDE**

This guide is all-inclusive and is designed to incorporate all the applicable items from the General Briefing Guide. If a specialized mission such as air refueling is anticipated, the specific briefing guide for that mission should also be used.

MISSION DATA

1. Time Hack
2. Mission Data Card
 - a. Call Signs
 - b. Aircraft/Location / Status
 - c. Takeoff/Landing Data (Worst Case)
 - d. Joker/Bingo Fuel
3. Actual/Forecast Weather
 - a. Home base
 - b. Alternates
 - c. Individual Weather Category/Mandatory Status
4. NOTAMs
5. FCIF/Pubs/Maps
6. Personal Equipment
7. Alert Packet
 - a. Authenticators/Duress Code
 - b. Security Procedures
8. Airfield Status
 - a. Actual versus Max Allowable Tailwind
 - b. Barriers
 - c. Navigation Aids
 - d. Hazards to Taxi/RCR

GROUND PROCEDURES

1. Aircraft/Armament Preflight
2. Cockpit Set-Up
3. Engine Run/Hot Preflight
4. Crew Chief Briefing
 - a. Act only on pilot's instructions

- b. Ground emergency procedures
 - c. Hand signals
 - d. Aircraft danger areas
5. Quick Check Procedures

LAUNCH PROCEDURES

1. Notification/UHF Frequency/Authentication Requirement
2. Status
 - a. Airborne Order
 - b. Battle Stations
 - c. Runway Alert
 - d. Scramble
3. Taxi
4. Takeoff/Runway Lineup/Interval/Formation
 - a. Day VMC
 - b. Day IMC
 - c. Night VMC
 - d. Night IMC
5. Join-up/Trail Formation/Power Settings/Airspeeds

IN-FLIGHT PROCEDURES

1. Formation
2. Airspeeds
3. Weapons Safe Checks
4. Radar Search Responsibilities
5. Degraded Fire Control System
6. Transfer of Lead Procedures
7. Ops Checks
8. EMCON Procedures
9. Region Minimum Safe Altitude (MSA)
10. VID Procedures
 - a. Authority Required to Close
 - b. Formation/Tactics
 - c. Range/Altitude Separation Requirements on Target Prior Permission to Close With/Without

Visual Contact

- d. Radar Lock-On Requirements
 - e. Maximum Closure Speed
 - f. Minimum Airspeed
 - g. Loss of Contact Procedures
 - h. Breakaway Procedures
 - i. Restrictions
- 11. Aircraft in Distress
 - a. Minimum Closure Distance
 - b. Visual Signals - Day/Night
 - c. Escort Procedures
 - d. Recovery/Landing Visual Signals
 - e. Dissimilar Formation Procedures
 - 12. Jettison Procedures
 - 13. Lost Wingman
 - 14. SARCAP
 - 15. Emergency Airfields

SPECIAL SUBJECTS

- 1. Emergency of the Day
- 2. Fuel Awareness
- 3. Maneuvering Limitations
- 4. Recognition/Prevention/Recovery from Loss of Control
- 5. Spatial Disorientation
- 6. Recall Procedures
- 7. Rules of Engagement (ROE)
- 8. Hazards Associated with Human Factors (i.e., Channelized Attention, Task Saturation/Prioritization, and Complacency)

Attachment 14**NVG BRIEFING GUIDE**

This guide is meant to highlight general NVG considerations, and provides a reference for a basic NVG briefing. All applicable NVG considerations should be incorporated into the specific briefing for the mission being flown.

WEATHER/ILLUMINATION

1. Civil/Nautical Twilight
2. Moon Rise/Set Times/Phase/Elevation/Azimuth
3. Ceiling/Visibility
4. Lux/EO TDA
5. Obscurants to Visibility

NVG PREFLIGHT

1. Check Adjustments/Helmet Fit and Security
2. Batteries
3. Resolution/Focus
4. NVG Compatible Flashlight

COCKPIT PREFLIGHT

1. Cockpit Setup
2. Cockpit Lighting (Leaks)
3. Cockpit FAM
4. Check Focus and Stow for Taxi

BEFORE TAKEOFF

1. Don NVGs/Check and Adjust/Disconnect
2. Stow for Takeoff

AIRBORNE

1. Exterior Lights
2. Donning and Doffing Procedures
3. Scan Pattern
 - a. Forward Scan
 - b. Narrow Field of View
 - c. Peripheral Vision
 - d. Scan Techniques
4. Join-up and Enroute Considerations
 - a. Rejoin/Closure
 - b. IFDL / A-A TACAN
 - c. G-Awareness Considerations
 - (1) Lighting
 - (2) Deconfliction/Separation

MISSION

1. Route Study/Scene Interpretation
 - a. NVG Predictions/Albedo
 - b. Terrain/Shadowing/Visual Illusions/Visible Horizon
 - c. City/Cultural Lighting
 - (1) Direction/Orientation of Lighting
 - (2) Aggressive Formation Maneuvering
 - (3) Terrain Avoidance
 - (4) Map Reading

TARGET AREA

1. Holding Procedures (NVG Differences)
2. NVG Lost Wingman
3. Deliveries/Pattern Procedures
 - a. Minimum Altitudes
 - b. Flight Member Responsibilities
 - c. Moth Effect
 - d. Deconfliction
 - e. External Lighting/Deconfliction Procedures
4. A/B, Flares, and IR Detection Considerations
5. Threat ID and Reaction
6. Egress

NVG SAFETY

1. NVG Lost Sight
2. NVG Lost Wingman
3. Depth Perception
4. Visual Illusions
5. NVG Failure
6. Battery Failure/Swap Out
7. Overconfidence in NVG Capabilities
8. Entering Weather/Transition to Instruments
9. Correct Lighting of Primary/Secondary Flight Instruments
10. Disorientation/Misorientation/Vertigo
11. Deconfliction ROE
12. Transference
13. Target Fixation
14. Lack of Dive Information
15. Fatigue
16. Aircraft Emergency and NVG BDA Considerations
17. Ejection/Goggles Off
18. Laser Eye Protection (LEP) Use
19. NVG FOD Considerations (Batteries, Equipment, Filters, etc)

Attachment 15

GROUND CREW BRIEFING GUIDE

GROUND CREW

1. Act only on pilot's instructions
2. Ground emergency procedures
3. Hand signals
4. Aircraft danger areas

Attachment 16**MISSION DEBRIEFING GUIDE****GROUND PROCEDURES****TAKEOFF/JOIN-UP/DEPARTURE****ENROUTE PROCEDURES****RECOVERY/LANDING/AFTER LANDING****GENERAL**

1. SIIs
2. Radio Procedures
3. Flight Discipline/Effectiveness

MISSION ACCOMPLISHMENT/ANALYSIS

1. Mission Reconstruction
2. Debrief Focus Point(s)
3. DMVR Assessment
4. Anti-G Straining Maneuver Effectiveness
5. Objectives Analysis
6. Debrief Focus Points / Root Cause / Instructional Fixes (as applicable)

COMMENTS/QUESTIONS